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The NATIONAL GEOGRAPHIC MAGAZINE

JUNE, 1921

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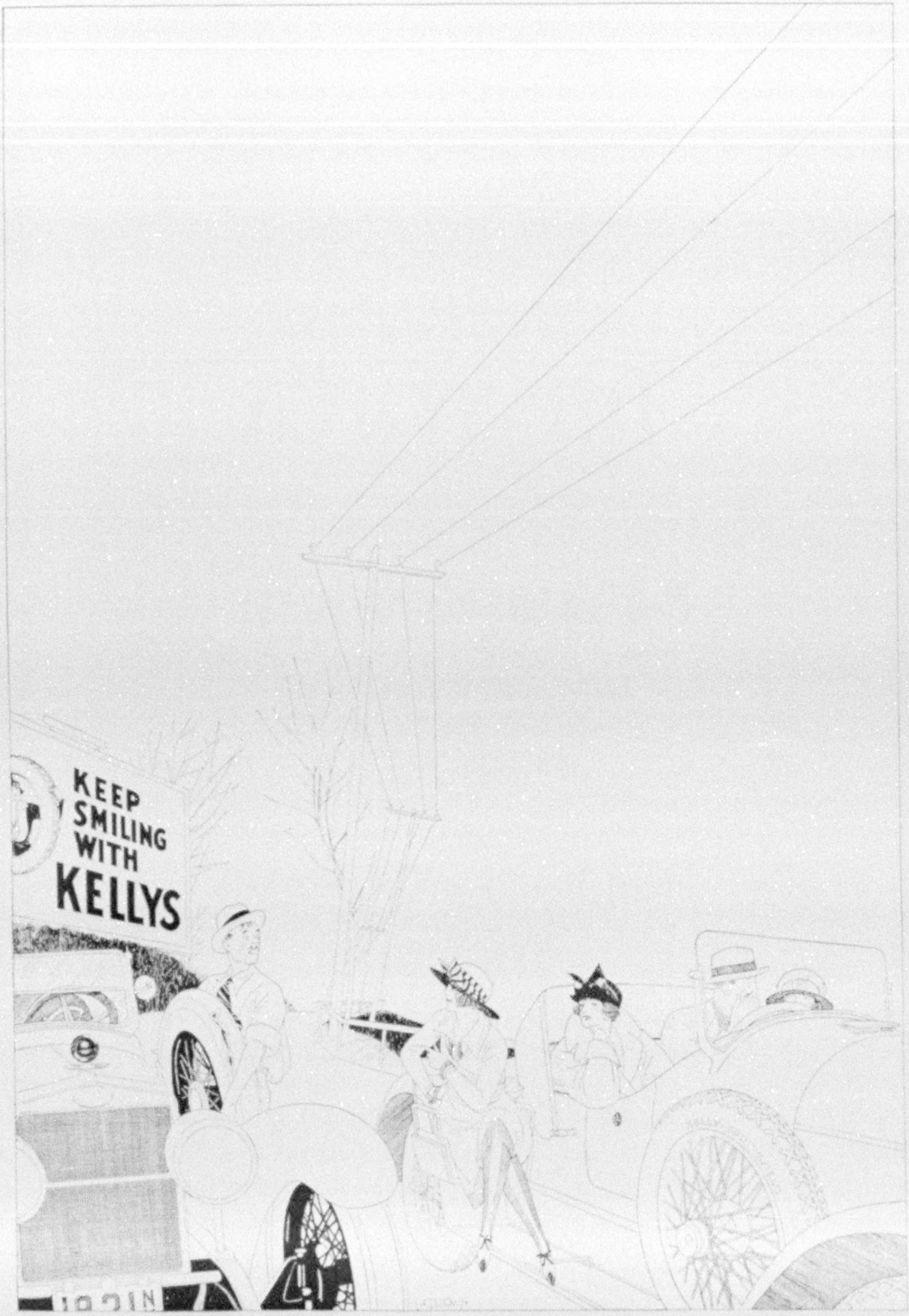

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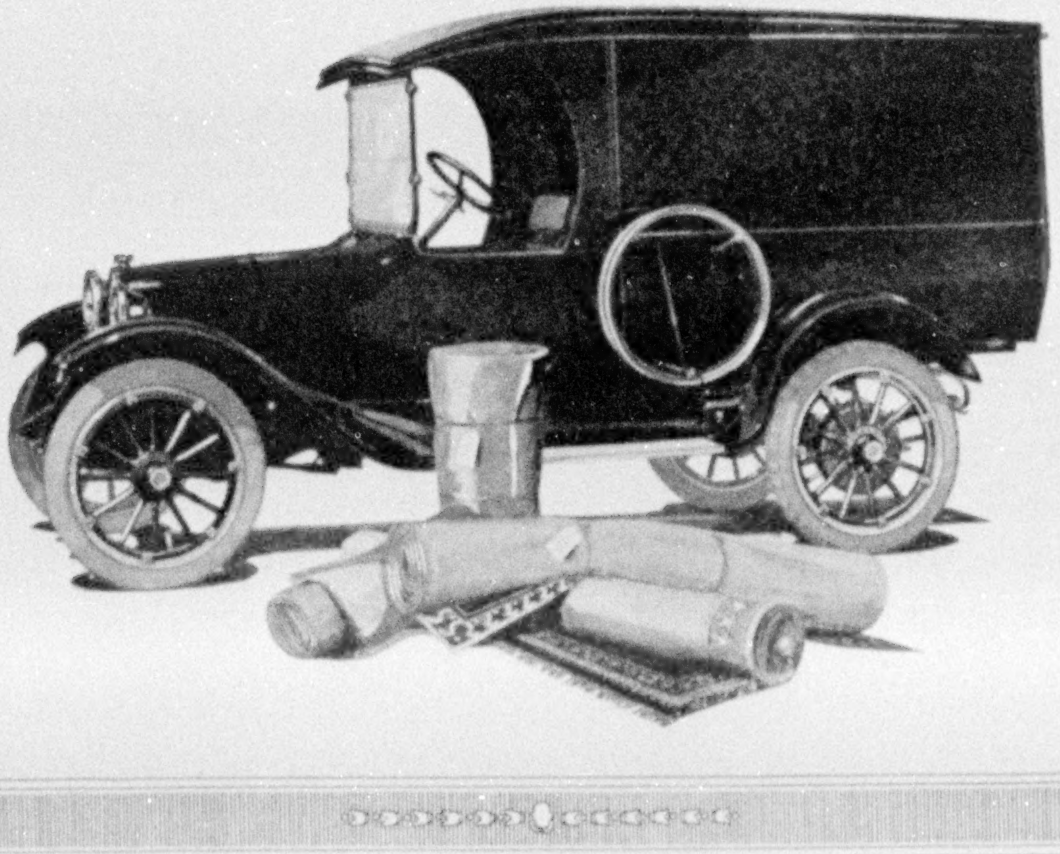

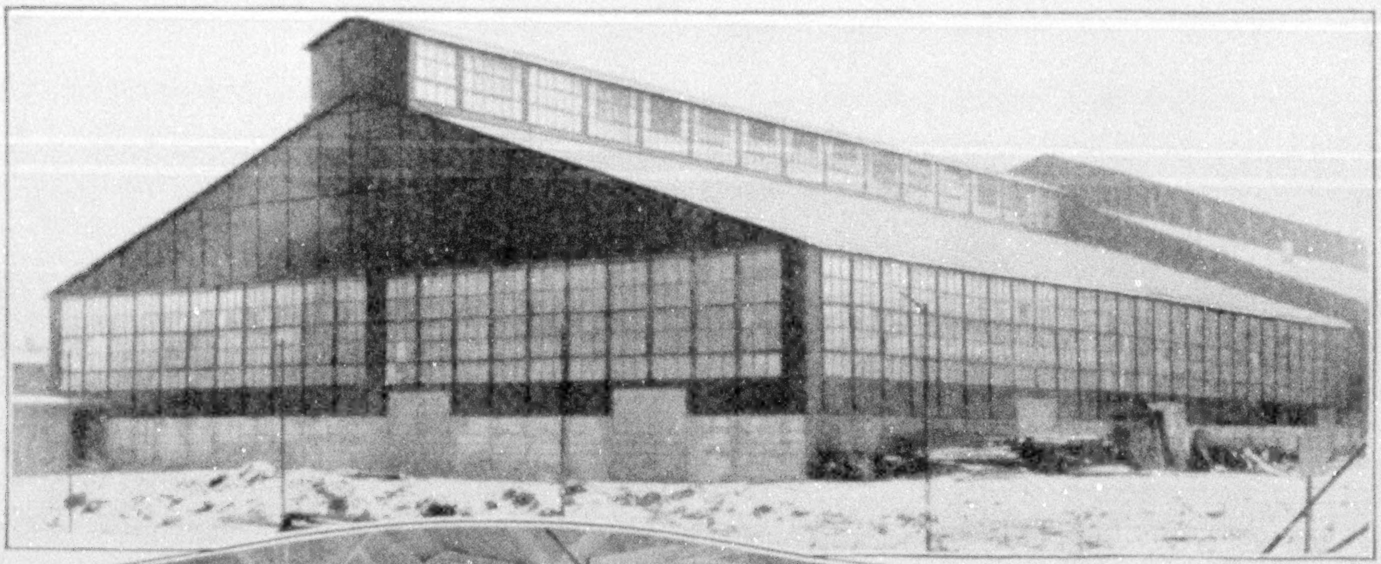

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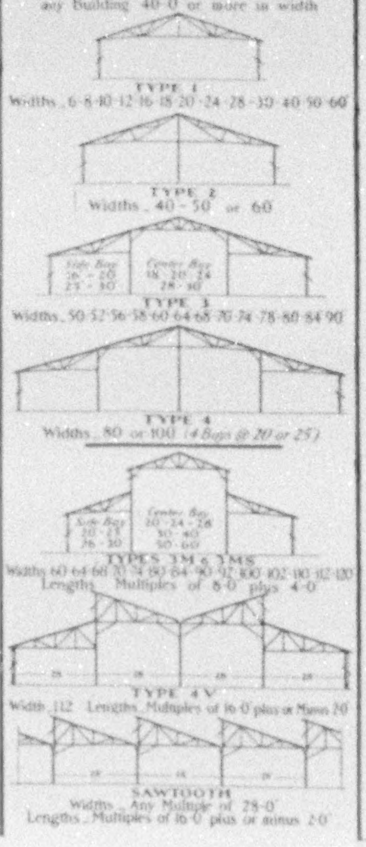

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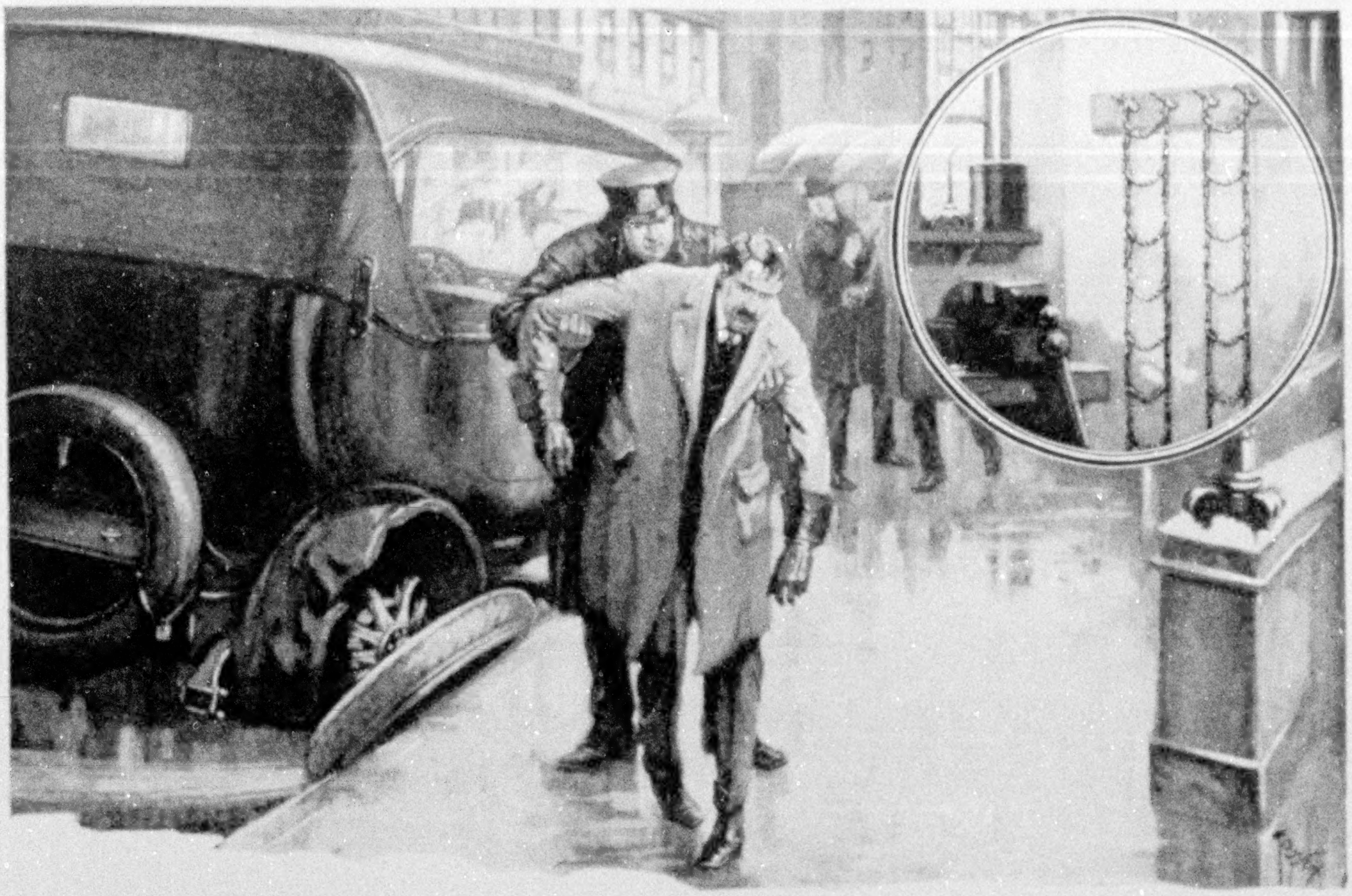

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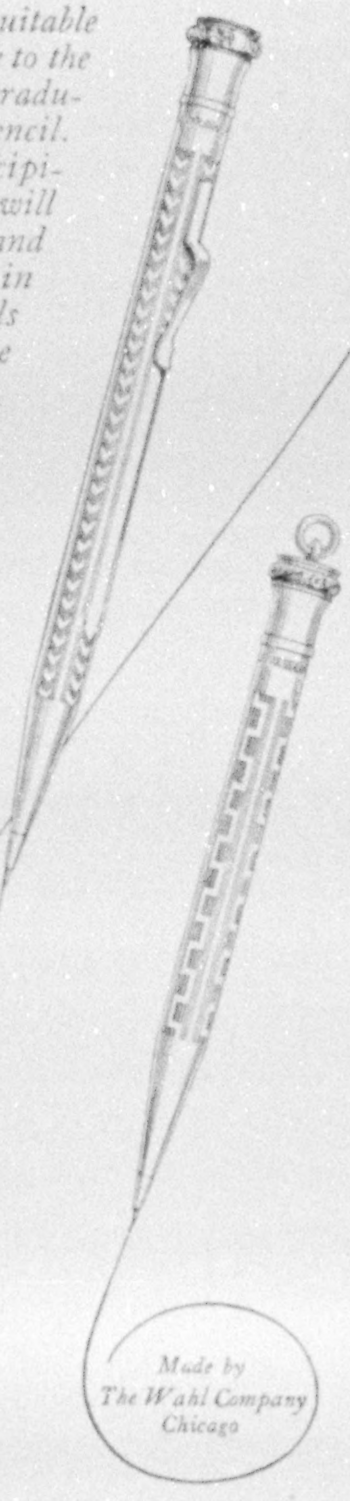

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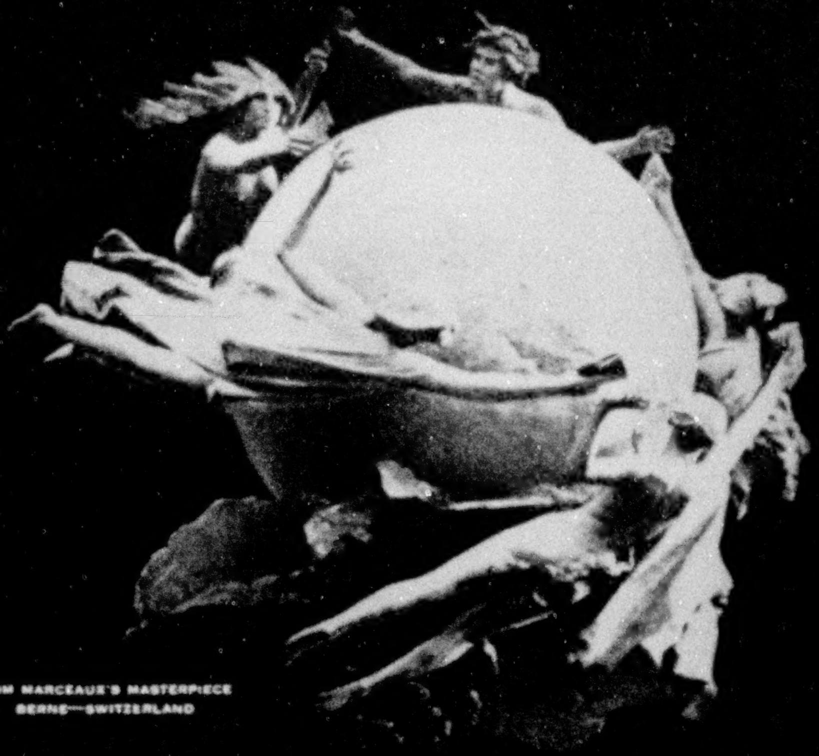

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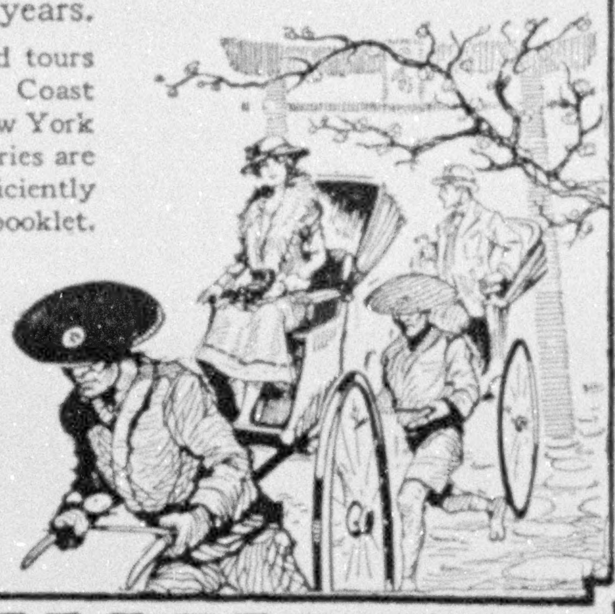

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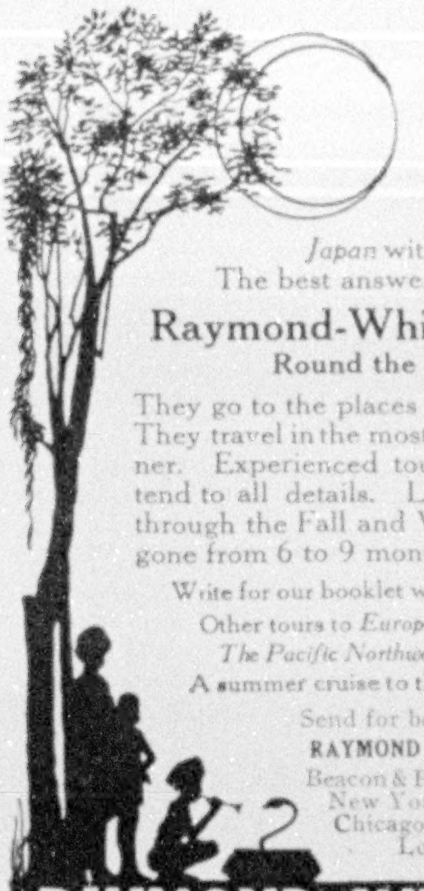

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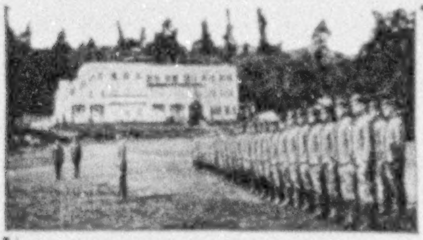

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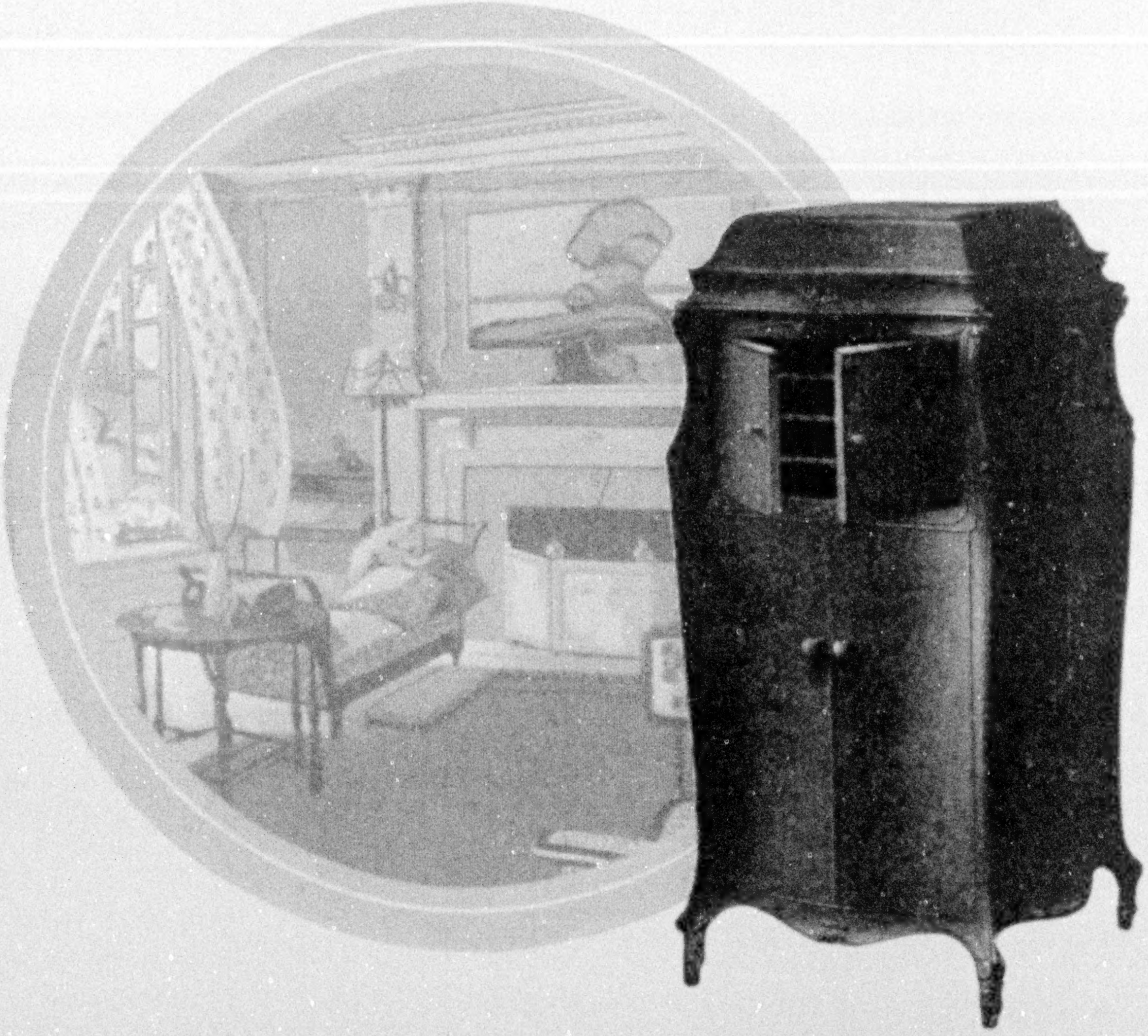

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ACROSS THE EQUATOR WITH THE AMERICAN NAVY

By Herbert Corey

Author of "On the Monastir Road," "Cooties and Courage," "Shopping Abroad for Our Armies in France," and "A Unique Republic, Where Smuggling is an Industry."

"WHY do you ask questions about the ships?" inquired the commander. "A navy isn't ships. A navy is men."

During the winter of 1920-21 I accompanied the American battleship fleet on its winter cruise. The Atlantic fleet of seven battleships and eighteen destroyers, commanded by Admiral H. B. Wilson, with the accompanying auxiliary vessels of its train, joined the precisely similar Pacific fleet under Admiral Hugh Rodman at Panama. The combined fleets cruised together to a short distance south of Callao, Peru. There they separated, the Atlantic fleet turning back to pay a visit of ceremony to the Republic of Peru, while the Pacific fleet continued on to the Republic of Chile.

Then a juncture of the fleets was again effected and they cruised in company to Panama, where the annual inter-fleet athletic competition was held. En route literally every moment possible was occupied in the practice of maneuvers.

ON SHIP DRILL DEPENDS WAR-TIME VALUE OF THE FLEET

Upon the degree of perfection reached in these ship drills depends in great part the war-time value of the fleet. It will not have been forgotten that in the battle of Jutland Admiral Scheer saved the German fleet because he was able to execute perfectly an evolution which naval authorities had declared impracticable in the hour of battle.

Upon the second separation, the two fleets left for their winter practice grounds, on opposite sides of the continent.

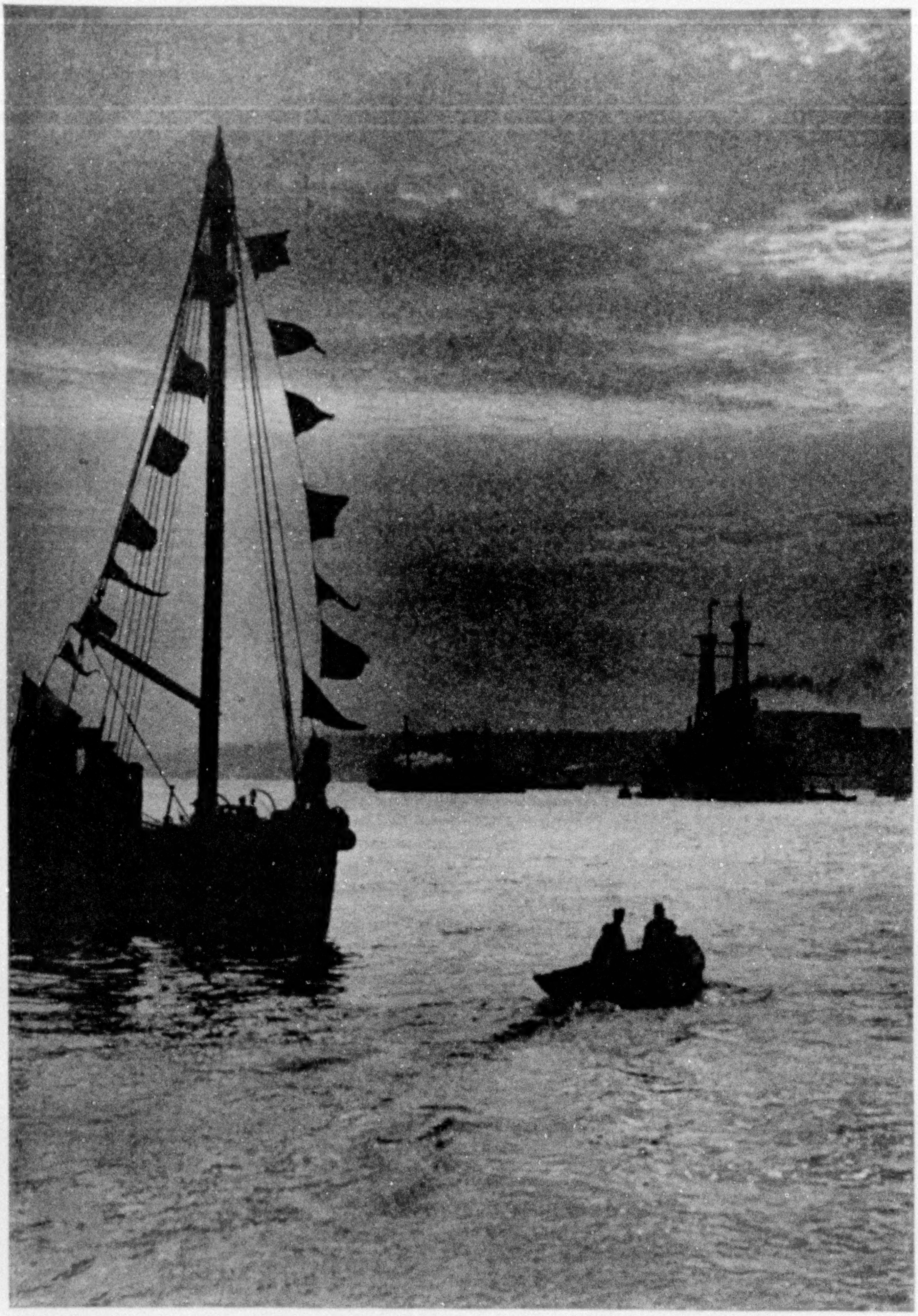
MAKING A GOOD SAILOR A BETTER AMERICAN

Throughout this period of close association I was over and over again impressed with the truth of the statement quoted. It is the conviction of the leaders of the American Navy that "a navy is not ships. It is men." They bend every effort toward the production of a personnel of extraordinary intelligence. They do their best to provide them with the best ships and guns and submarines and air-craft that can be built. But they hold fast to their guiding principle, that the material elements of the navy are but the instruments through which the genius of the men can be expressed.

Because the American enlisted man does not, as a rule, care to serve more than one term afloat, the navy's efforts have been extended over a wider field than those of other countries.

The American is made into an excellent sailor, as a matter of course; but it is likewise the navy's effort to make him into a better American. With this end in view, he is offered every opportunity to gain an education; he is taken on

XUM



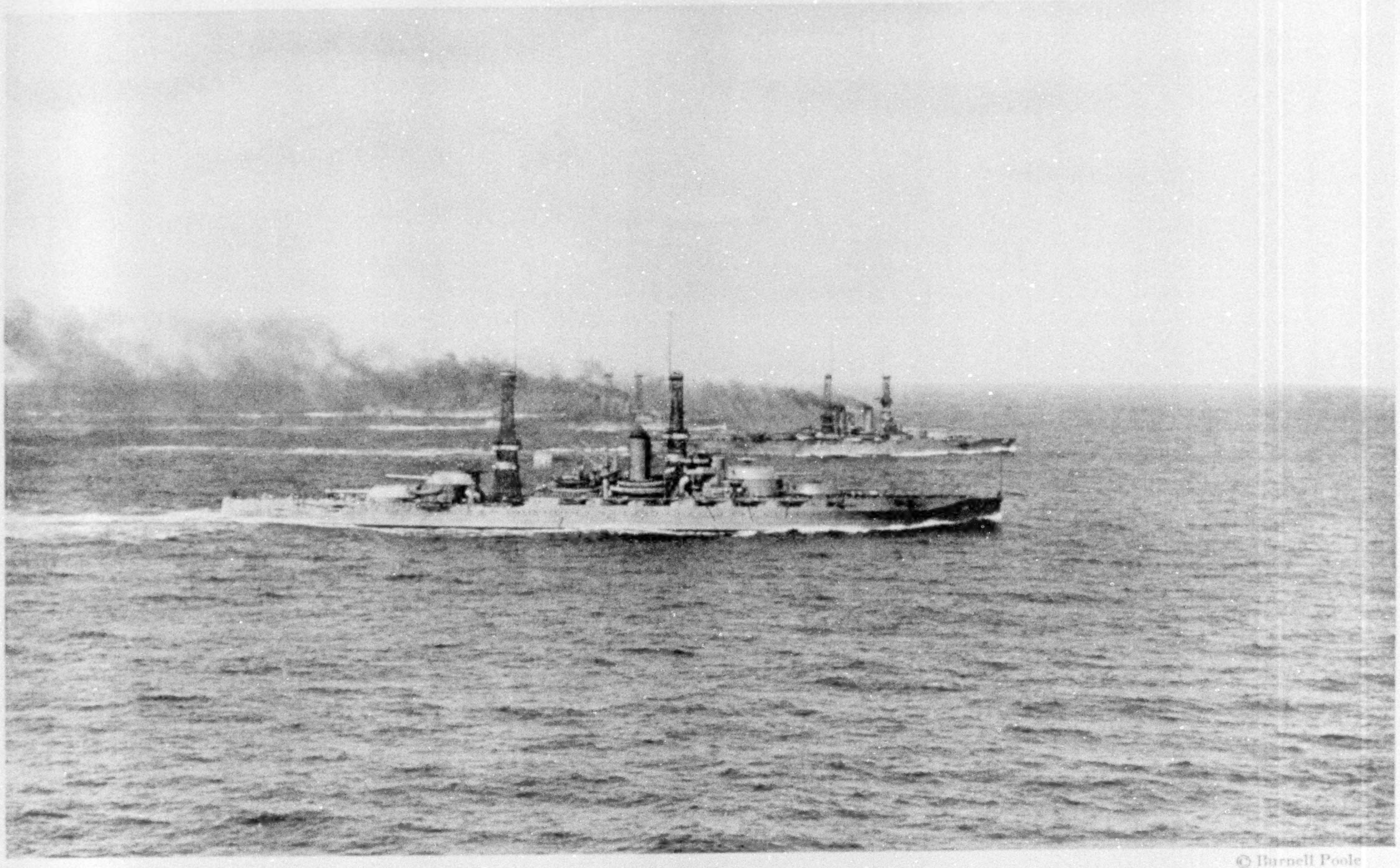
Photograph from Edwin Levick

ONE OF THE AMERICAN NAVY'S FLOATING FORTRESSES SEEN BY MOONLIGHT

Each officer of the United States Navy has a pet story to prove that the American is the smartest sailor and best fighting man that ever crawled into a turret.

A "BOAT," ITS "GOBS" AND ITS OFFICERS

In the lingo of the sea, a destroyer is always referred to as a "boat," while the enlisted men of every naval craft are "gobs" (see text, pages 581 and 594). In the center of the front row of officers (seated) is Commander Byron McCandless, co-author of THE GEOGRAPHIC's famous Flag Number. During the World War, Commander McCandless was in command of this destroyer, the *Caldwell*.



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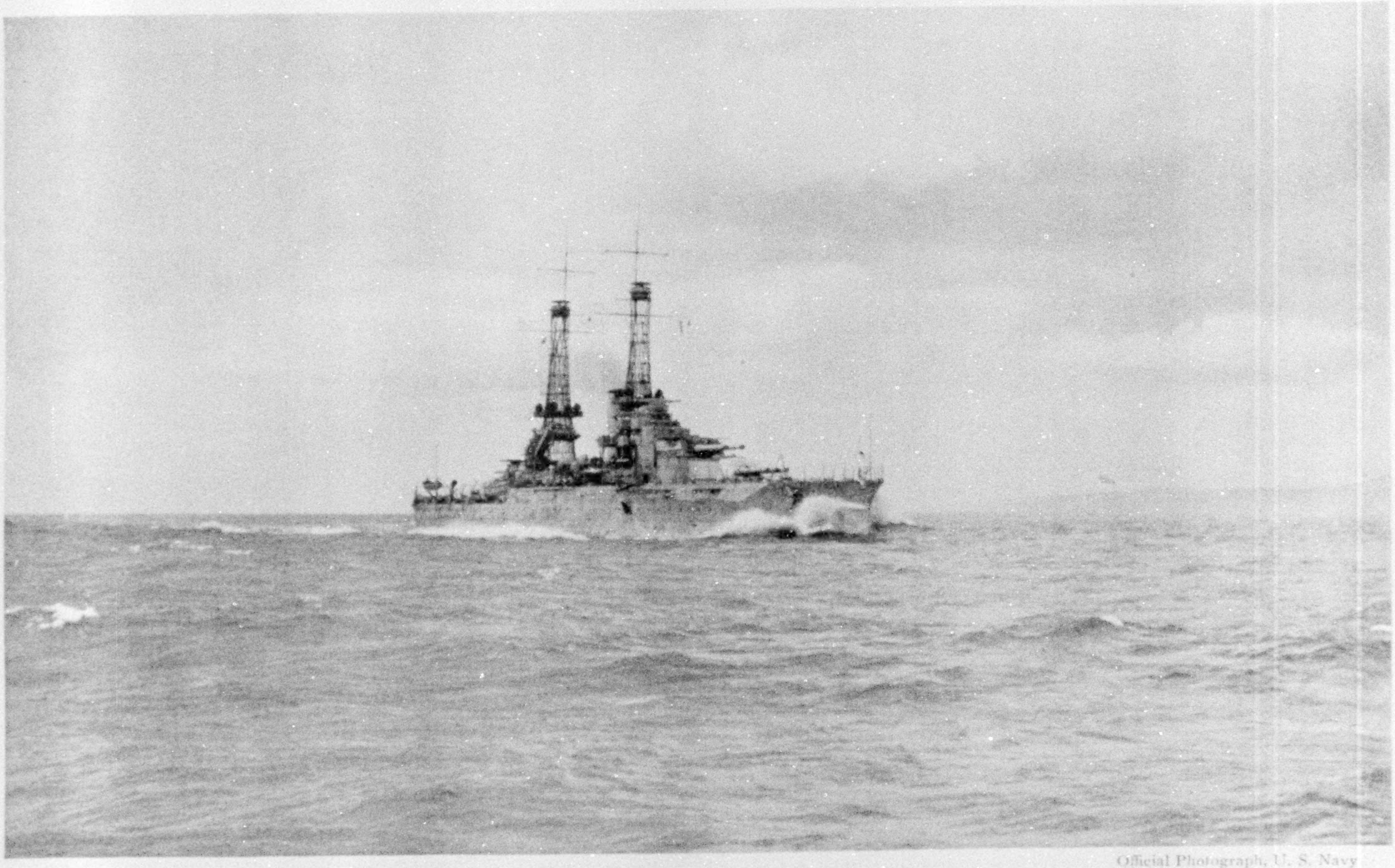
SUPERDREADNOUGHTS OF THE ATLANTIC FLEET IN LINE-ABREAST FORMATION DURING MANEUVERS AT SEA

The *Arizona*, nearest the camera, and its sister ships, the *Idaho, Mississippi, New Mexico, Pennsylvania,* and *Tennessee,* constitute the most powerful units of the United States Navy. The first battleship equipped with 16-inch guns, the *Maryland,* goes into commission this month (June, 1921).



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ONE OF THE PRIDES OF THE U. S. NAVY, THE BATTLESHIP "OKLAHOMA," IN GUANTANAMO BAY

Sixty-three officers and 1,565 men constitute the complement of this fighting craft, with its main battery of ten 14-inch guns.

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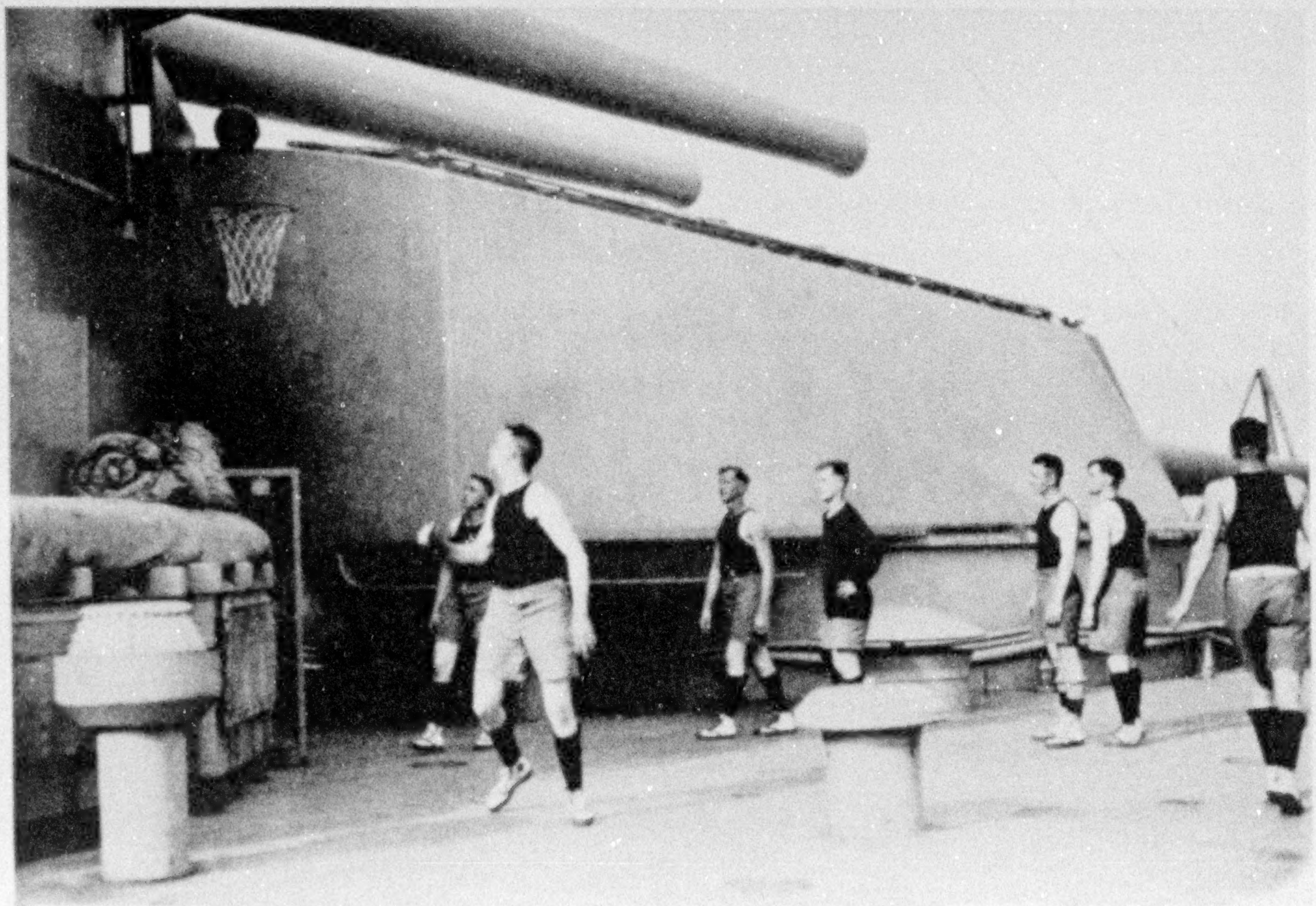
AFTERNOON BAND CONCERT ON THE QUARTERDECK



Official Photograph, U. S. Navy

PLAYING BASKET-BALL ON SHIPBOARD

Official Photograph, U. S. Navy

LEARNING TO AIM TRUE WITH MACHINE-GUNS ON THE GUANTANAMO RIFLE RANGE

With its 264 rifle and 60 pistol targets, this is the finest rifle range used by the United States. It is a part of the 30,000 acres in the vicinity of Guantanamo rented from the Cuban Government as a naval base.

jaunts about the world; he is well fed and well clothed and his physical and moral health are guarded.

Upon his return to civilian life he has attained to a higher and more intelligent standard of citizenship.

ON BOARD THE "BLACK HAWK"

The departure of the Atlantic fleet from the Brooklyn navy yard at dawn on the morning of January 4 was unostentatious and unpicturesque. Battleships and destroyers worked singly down Ambrose Channel to effect fleet formation well out at sea.

The vessels of the train—the colliers and the supply-ships and the tenders and the cruising foundries and repair shops—smashed and wallowed in their wake.

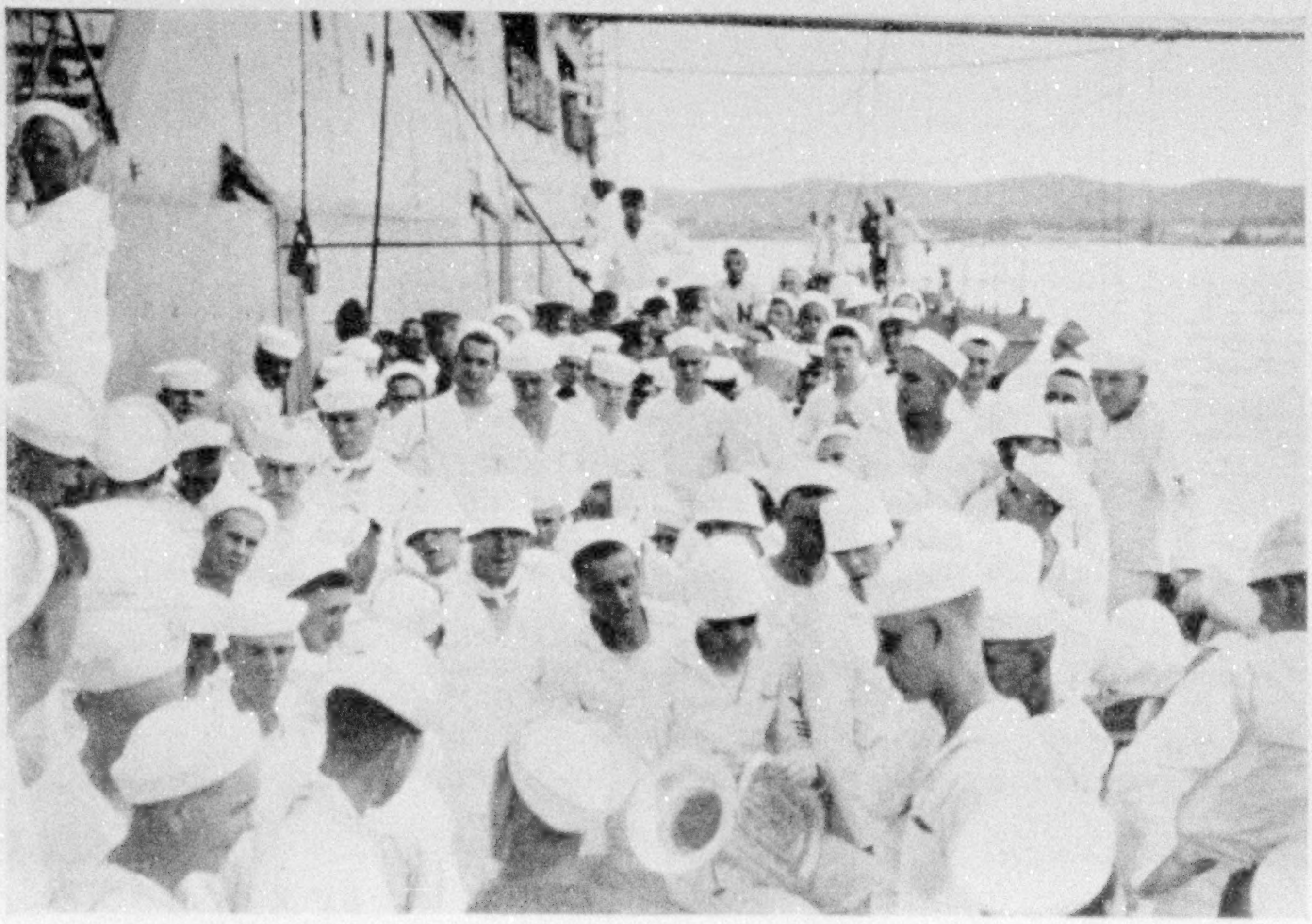
After a time one capitalizes The Train. It is not dashing and it is a bit grubby, and no one has a kind word for it; nor has The Train a kind word for any one else. But it is what the lines of communication are to the army. Without The Train, the fighting craft had best not put to sea.

On board the *Black Hawk* one pitied the raw recruits. When the old Grace liner began to hit up her conservative twelve knots an hour, one saw the desire to see the world abate visibly in these young breasts.

The *Black Hawk* was dirty, of course. So was every other ship in the fleet. They had been lying alongside docks, submitting to repairs and taking in stores, for weeks on end. It had not been worth while to clean ship, even if it had been possible in the raw air of a northern winter. But no sooner were the ships in clean blue water than the toilet operations began.

The cargo boom of the *Black Hawk* was astraddle with boys, many of whom had never seen the sea before. The regular rise and fall of her deck sent them perishing with agony. They clung with arms and legs to the boom and put their heads down on it and cursed the sea and those who go down to it in ships. They reminded one of nothing so much as a parcel of young raccoons clinging bottom side up to tree branches.

"GOBS" COMING ASHORE AT THE RECREATION GROUNDS, GUANTANAMO



Official Photographs, U. S. Navy

AMERICAN SEAMEN IN THE MAKING ON SHIPBOARD

Soap and the safety razor are in active service with the American bluejacket. Cleanliness is one of the cardinal virtues of the men of the Atlantic and Pacific fleets.

AMERICAN BLUEJACKETS BARTERING WITH NATIVES IN ONE OF THE WEST INDIES

Official Photographs, U. S. Navy

THE "GOB'S SPECIAL," AT BRIDGETOWN, BARBADOS, BRITISH WEST INDIES

The dictionary will inform you that a "gob" is "a mass or lump, as of mud or meat; a large or good-sized mouthful; also a large sum, as of money," but not a word about sailor or seaman. How the word came to be applied to the American bluejacket is a matter of mystery, but the "gob" himself has done it, and, despite all officialdom, "gob" he is to his messmates.

Official Photograph, U. S. Navy

ON THE BEACH AT GUANTANAMO

It is here that the enlisted man begins in earnest to lose the pallor, the narrow shoulders, the white knobs, and bony angles of the civilian and to take on the saddle-colored coat of tan and other attributes of husky health.

But as the worst of the sorrow passed they began to scrub the caked grime, and before the *Black Hawk* was in southern waters they were being swung alongside in cradles to paint her hull. They were already critical of other ships which had not been polished up.

THE MOTHER OF THE DESTROYERS

In the official lists the *Black Hawk* is referred to as the tender for the destroyers. On board she is known as "the mother," and this is the better title.

Almost anything that can happen inside a destroyer can be patched up by the magicians on board. The destroyers run to her with their real and imaginary troubles. They demand potatoes, brass screws, postage stamps, tooth-pulling, and sympathy.

"What's that?" I used to groan each morning in port when the steam winch over my head began to bang and clank.

"A damned destroyer," my room-mate would reply with emphasis. "A double damned destroyer. They spend their lives getting potatoes."

Eventually I learned that it was an article of the *Black Hawk's* creed that no destroyer ever goes to sea with more than a pint of oil in her bunkers; that any one of them would cheerfully start around the world on half a loaf of mouldy bread and a cigarette; that none ever carried spare parts against an engine-room breakdown or ever indented accurately for the parts when the breakdown came; that all destroyer men are idle, irreligious, improvident, and insane.

"They make us haul their condemned parts out to them in our own boats," the Black Hawk would cry, wildly; "Why? Why? Why don't they come gittim themselves? What do they think we are?"

A DESTROYER IS ALWAYS "A BOAT"

I am putting these things down for the moral betterment of the destroyers and to please the Black Hawk. Upon interrogating the boatmen, however—note: a destroyer is always a boat; never anything but a boat; to call a destroyer anything but a boat is evidence either of ignorance or malice; the Black Hawks never spoke of them except as destroyers—I learned they thought of the *Black Hawk* precisely as of a department store and are venomous over her defects in the matter of delivery.

"What do they think their job is, anyhow?" the men of the boats inquired, acidly. "It's their business to bring our spuds."

These relations, the sort of relations that might be expected between a violent and unlovely stepmother and a horde of wild and self-willed children, are modified, however, by the contempt which all persons, even remotely connected with the boats, feel for the "inefficients" who shelter themselves from the wrath of the sea on cumbersome battleships. They say such persons might as well go to sea on dry-docks.

STRENUOUS LIFE ABOARD A BOAT

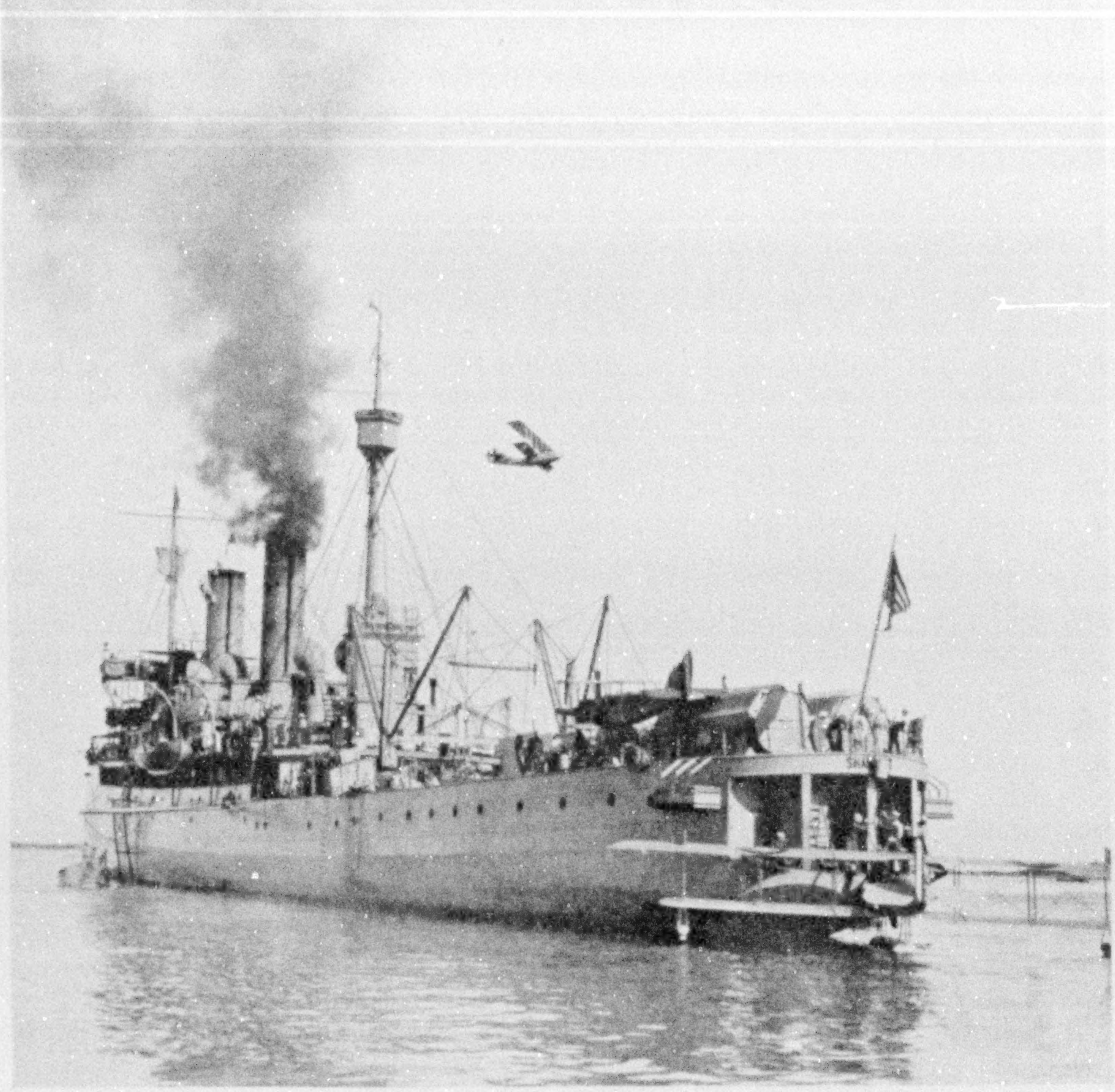
A boatman feels he is just a little better than other men. He lives harder, with less ease, fewer hot meals, more water in his boots, shorter hours of sleep, and more salt in his whiskers than any other seaman except, perhaps, the old-fashioned schoonerman who fishes for cod. He will take more chances, get away with more deviltry, and has less regard for the bones of his hands than any other man in the navy.

By the time the fleet began to buck the January seas off Cape Hatteras it had shaken down to that precision of movement which was rarely disturbed during the remainder of the cruise.

Ahead of us reached the seven battleships, plowing at one another's heels. Then came the vessels of The Train, under the guardianship of the old cruiser *Columbia*, which has a quaint habit of wallowing sidewise as she splashes along her uncertain course. On either broadside were the lines of destroyers.

One suffered for these thoroughbreds of the sea. They are at their best when permitted a speed of twenty knots or so. Thirty-five knots an hour for hours on end are nothing to them. At twelve knots they bob and roll and swing to every slant and ripple of the uneasy water.

And the fleet was pursuing its matter-of-fact twelve knots an hour. That is the economical cruising speed for bat-



Official Photograph, U. S. Navy

THE MOTHER-SHIP OF THE FLYING BOAT FLOTILLA, THE "SHAWMUT"

Once a lowly excursion boat plying Long Island Sound, the exigencies of war opened to this vessel a more serious field of usefulness. When a seaplane is in distress the *Shawmut* rushes to the rescue. Her new dignity and responsibilities, however, have not caused her to change her abominable habit of rolling unpardonably even in the most tranquil sea.

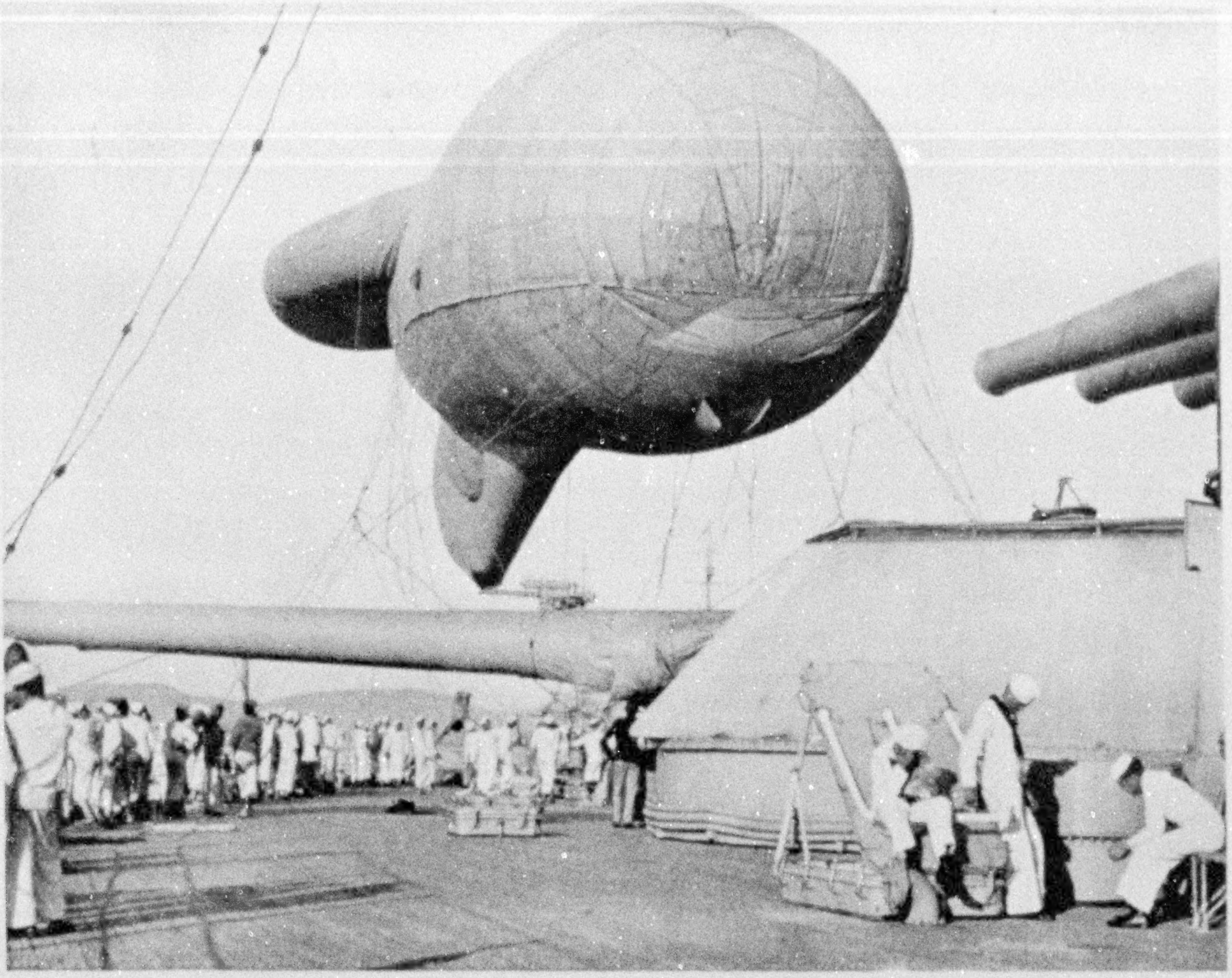
tleships. Instead of cutting knifelike through the tumble of water, the destroyers rolled and jerked and rumbled like drums to the tapping of the impertinent waves.

NO SLEEP ON A BOAT WHEN THERE'S A BIT OF A SEA

At such times, especially if there is a bit of a sea on, no one thinks of sleep on a destroyer. Old hands have an acrobatic habit of wedging their heads and necks in a corner of the berth and so securing a certain amount of rest. The cabin transom is really the best place to sleep, though. One can so pack pillows and coats that there is at least a chance of staying on.

One night on the *Black Hawk* a vicious rain squall wakened me. I had been sleeping with my state-room ports open, and as I drowsily raised myself to cut off an incipient flood I was fascinated by what I saw through the open ports.

The line of destroyers had approached our starboard more nearly than ever before, so that I could see their drunken lights reel over the sea. The waves were piling high, as they have a habit of doing when the Gulf Stream runs coun-



Official Photograph, U. S. Navy

A KITE BALLOON ATTACHED TO THE BATTLESHIP "PENNSYLVANIA," USED FOR SPOTTING PRACTICE

ter to the wind, and the unfortunate boats, pulled down to the agonizing twelve knots an hour, were stumbling and swinging helplessly.

One could imagine how the green water spouted over their bridges and hissed down the engine-room hatches, and what a foul smell of oil and bilge and stale food and cigarettes and pipes and perhaps a few oranges (there are folk who hold that an orange is sometimes a help in seasickness) was battened inside those airless cabins; for when a destroyer gets away from port on anything but a painted ocean all apertures must be stopped against the water. It spurts through every keyhole.

LOYALTY TO HIS CRAFT A BOATMAN'S CHIEF CHARACTERISTIC

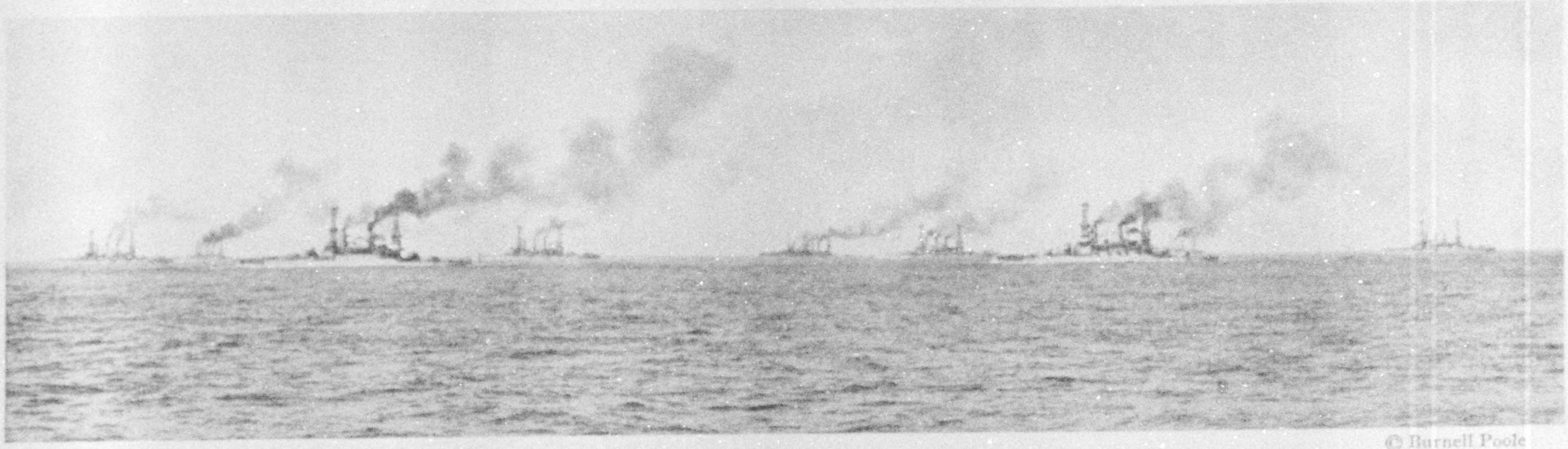
Yet no one belonging to the boats would think of leaving. The men come through a seven-day run looking as though stricken by the wrath of Heaven. On board the larger ships one might hardly know there had been wind or sea, but the men tumbling in a destroyer have been unable to bathe or shave or sleep.

Their food has been sandwiches, which they have only been able to eat by hooking one arm around a stanchion. They are covered with bruises, except where the flesh has been so indurated and woodened that it can bruise no more.

Their eyes are ringed with rime and red as those of an angry parrot. Yet they are so constituted that to tell about the boats they can go without food, sleep, or other necessaries. Their eyes shine and they reach for your arm to shake you into an appreciation of their pets.

"Come with me," said the engineer of the destroyer squadron at the end of a particularly nauseous four-day wallow on the *Black Hawk*. "I'll give you a treat."

Observation had made me somewhat skeptical of the potentialities of enjoy-



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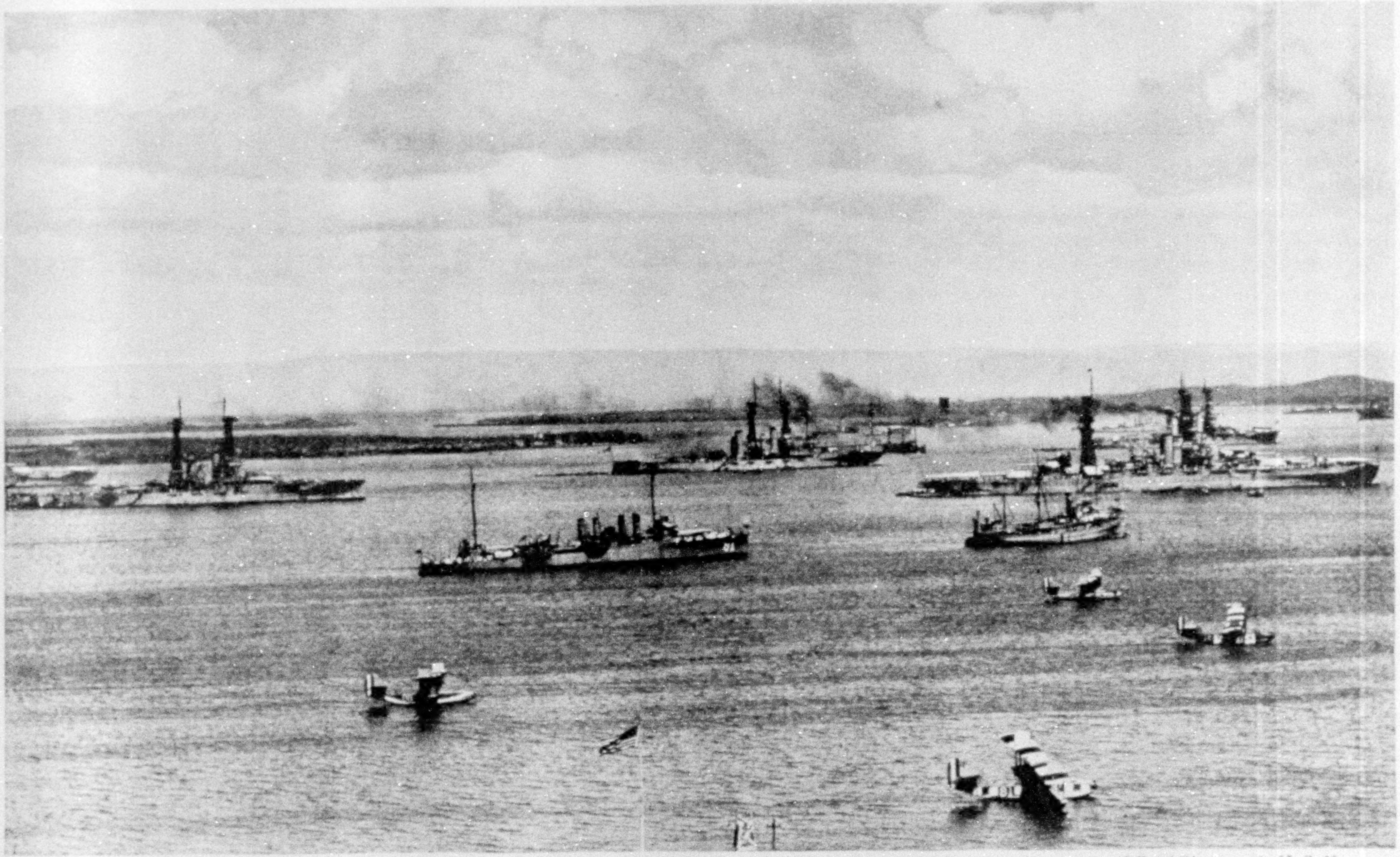
THE ATLANTIC FLEET AT SEA

Official Photograph, U. S. Navy

A FEW UNITS OF THE ATLANTIC FLEET IN GUANTANAMO BAY



Official Photograph, U. S. Navy

NAVAL AVIATION TAKES ITS PLACE WITH THE FLEET IN GUANTANAMO BAY

Battleships, cruisers, destroyers, mine-sweepers, and F. L. 5 flying boats are seen anchored in formation in the commodious bay of the naval base of the United States Navy off the southeast coast of Cuba.

© Publishers' Photo Service

IN THE HARBOR OF KINGSTON, JAMAICA, ONE OF THE FINEST IN THE WORLD

Kingston marked the end of the first leg of the flight of the Atlantic seaplane flotilla in the overseas voyage from Guantanamo to Colon.

© Publishers' Photo Service

DIVING FOR PENNIES IN THE CLEAR WATERS OF KINGSTON HARBOR, JAMAICA

This spirited scene is duplicated in all West Indian harbors where the water is clear and free from the danger of sharks.

ment offered by the treats of boatmen. But the officer was earnest.

"We'll make a speed run on the *Crowninshield*," said he. It does not seem proper to repeat what he said of the *Crowninshield*, or of certain other boats in the flotilla. No boat could possibly be so nearly perfect. Nor do I believe that boats develop an intelligence of their own, nor that they respond to affection as so many good children might.

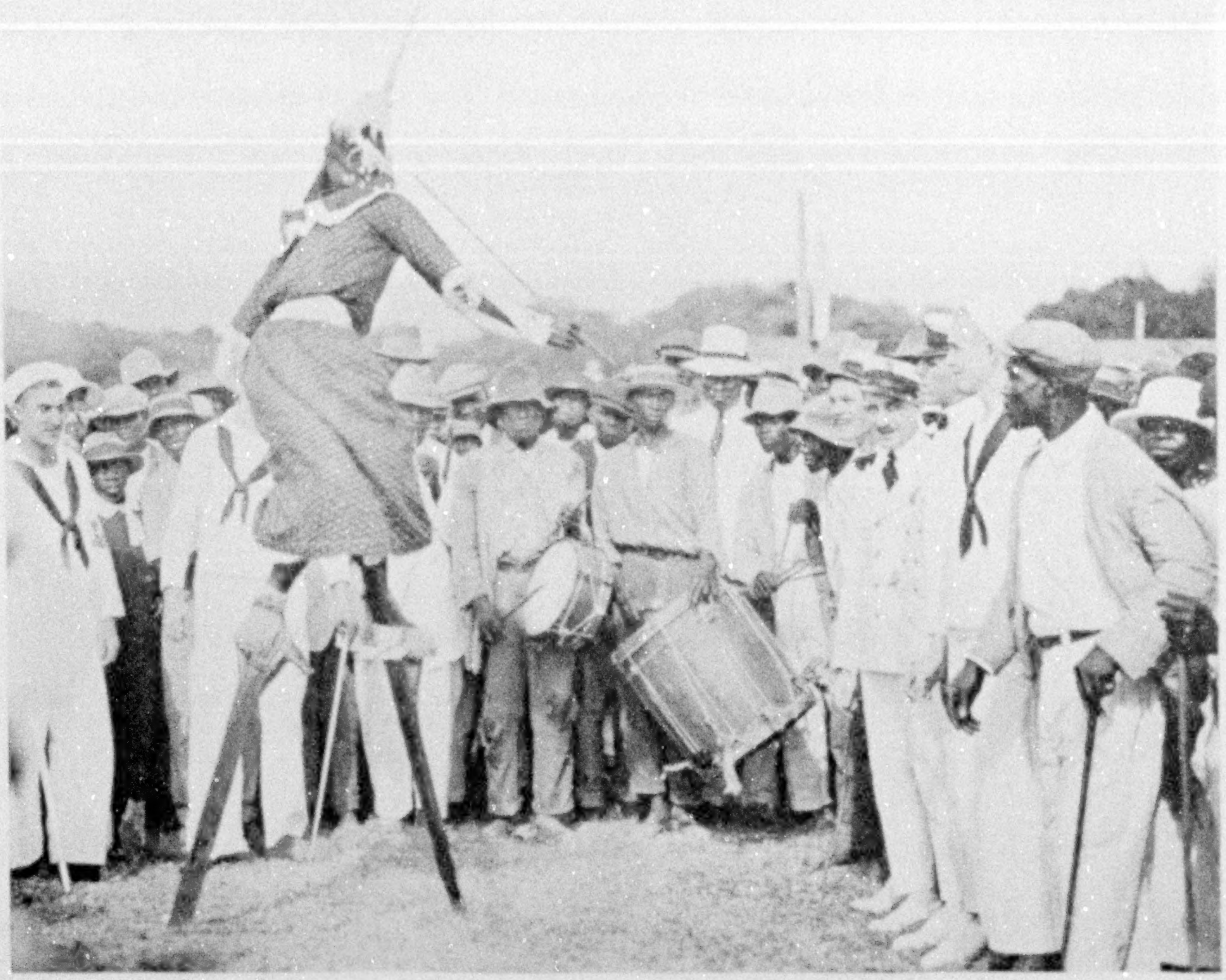
But one can see why the boats are so well loved. There is a freedom on them that is not to be found on the larger vessels, and snappy discipline, with few of the restraints of rank.

The least little fret in international relations may hold a chance to win a name. The boatman feels, I fancy, as the cavalryman does with a thoroughbred horse under him, or like the fighting flyer, as he storms up in a new plane. There must always be the sense of controlled power and independence and always the hope of adventure.

ARRIVAL AT GUANTANAMO

On the morning of January 9 we woke to find ourselves in the sheltered bay of Guantanamo, at the extreme southern tip of the Island of Cuba. Two days before the men had gotten into whites and the blue uniforms had been stowed away for another year.

Now the gobs stripped off blouses and by order appeared in the sleeveless sing-



Official Photograph, U. S. Navy

A STILT DANCE IN THE BRITISH WEST INDIES DELIGHTS THE AMERICANS

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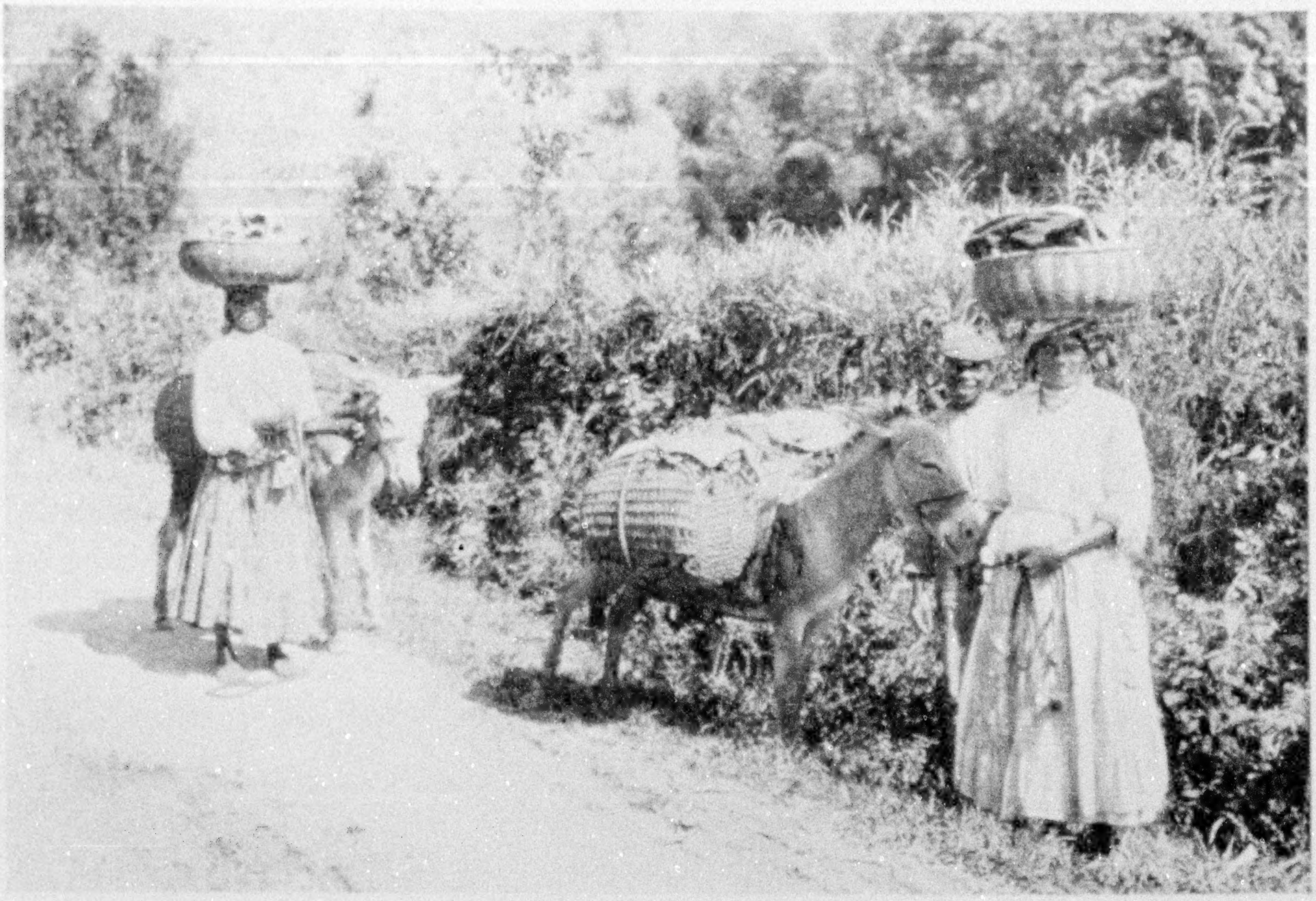
THE COLOR LINE IN JAMAICA



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A COUNTRY ROAD IN JAMAICA

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A BANYAN TREE IN KINGSTON, JAMAICA

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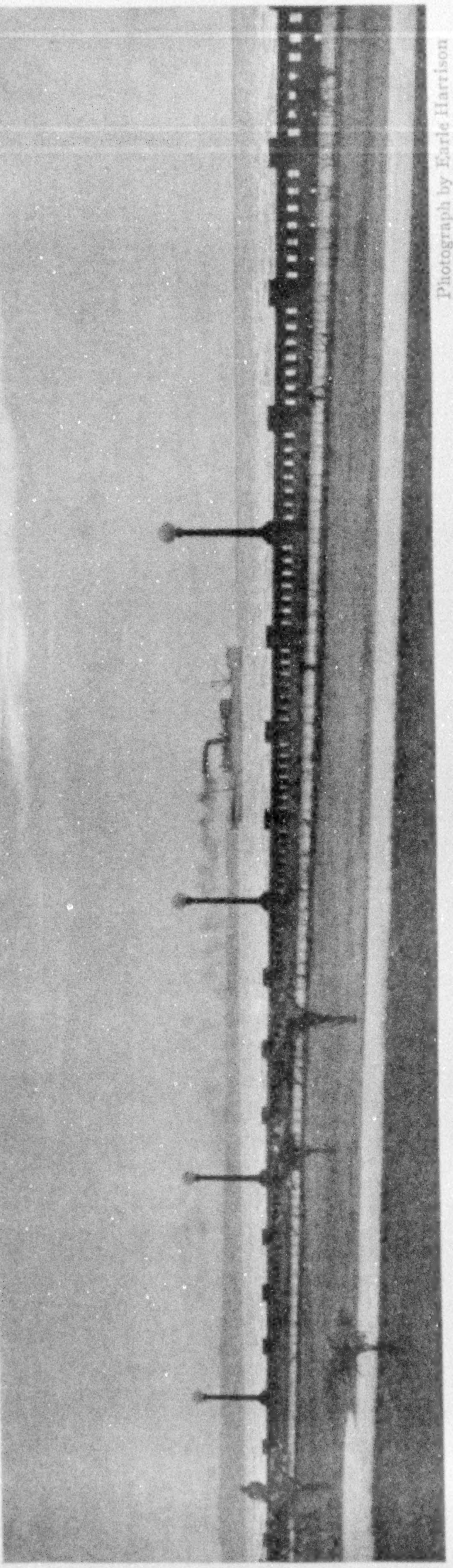


Photograph by Earle Harrison

THE SEA WALL AT TWILIGHT: COLON, PANAMA

let which is a part of the navy's working costume.

The decks began to offer sights that were at once absurd and pathetic. One thinks of a seaman as a lively person with thick shoulders and an excellent saddle-colored coat of tan, and spring in his heels; but these youngsters who timidly came out of their civilian husks offered studies in white knobs and bony angles.

Their elbows were sharp as boat-hooks and their poor little forearms were puny and pale as the stems of clay pipes, and their feet, slender and weak from years in leather boxes, stepped gingerly upon the rivet-studded deck.

Then the sunburning began. One sunburns by order in the navy, just as one gets vaccinated or shaved. The first day in the sleeveless singlets produced large blotches of bright and inflammatory red upon their virgin shoulders. By the second day some had neatly blistered.

There must be a virtue in sunburn. In another month these anemic, appealing kids had clothed their young skeletons with fine muscles and were as hard as so many sides of frozen beef. Some had begun to sprout little torpedo beards, too. But that is another story.

WHAT GUANTANAMO MEANS TO THE ATLANTIC FLEET

How many know that the United States has a plant of extraordinary value and efficiency at the Bay of Guantanamo? Or what it means to the Atlantic fleet each year? I did not. I'll confess it.

I had a vague idea that the fleet each winter visited a cactus-bordered beach on which the men walked for health's sake, and that from time to time it went outside for battle practice.

I knew there were a couple of tiny towns near by—Caimanera and Bucoron—where rum, roulette, and ruin might be had at a price. But the background to the picture was always bare white sand and cruelly hard sunlight and scrubby bushes, with a restless surf beating at an inhospitable strand.

That impression was utterly wrong.

Guantanamo Bay lies at the southern

tip of the Island of Cuba—a tip that is for the most part useless for farming purposes. It consists of a body of water almost completely landlocked, covering about 10,000 acres.

Not far away is the harbor of Santiago, where Admiral Cervera's fleet was crushed during the Spanish War. Some of the rusty hulks still lie in the water's edge.

Around the bay is a circle of low, brown hills, covered by a mesquite scrub, into which long, narrow valleys thrust like the outstretched fingers of a hand. The water's edge is bordered by the vivid green of the mangrove, except that occasional warm and sandy beaches invite swimmers.

Now and then the sharp fin of a shark is seen. Pelicans drift overhead with their air of aldermanic dignity. Fish-hawks are forever circling against a sky of almost incandescent blue.

THE FINEST RIFLE RANGE USED BY THE UNITED STATES

Here the United States has rented from Cuba, "for so long a time as it desires," an area of 30,000 acres, in which the bay is included and inclosed. A rental of $2,000 annually is paid.

At the station were 1,100 men at the time of the fleet's visit. There is a sufficient number of marines to preserve order and act as first aid in the event of any near-by trouble, and the remainder are workmen.

The striking features are the rifle ranges, which have a capacity of 264 rifle targets and 60 pistol targets up to 1,000 yards range, and can be expanded indefinitely.

This is the largest and finest range used by the United States. In a month ranges could be placed up these narrow valleys, against the background of the soft brown hills, in which ten thousand men could be taught sharpshooting each day.

Once there was a golf course, but it has been made over into a landing ground for the ship-planes that were forever maneuvering overhead. They are to be carried on especially built vessels, and a maximum of skill will be required of the flyers to get away from and return to these moving platforms without accident. Hence the continual acrobatics in the air.

LIGHTNING PLAYS HAVOC WITH BALLOONS AT GUANTANAMO

There is a balloon school, too, in which observers are taught to ascend in captive balloons—the "sausages" of the war—but Guantanamo's neighborhood seems to be dangerous to these craft. Last year three were brought down by lightning.

There are hospitals and club-houses and canteens.

On the flat land ten baseball diamonds have been laid out for the use of the fleet, and ground has been cleared for others. There are tennis grounds and handball courts and all the features that are needed in a plant which is designed not only as a training ground for 15,000 to 20,000 seamen annually, but to provide for their healthful recreation.

The wild animals of the hills have learned that this is sanctuary, so that one sees deer now and then and kicks flocks of wild guineas from beneath one's feet. The commandant has built good roads and pleasant walks and charming gardens, but the principal attraction—as soon as the gobs hear of it—is the pig-pen.

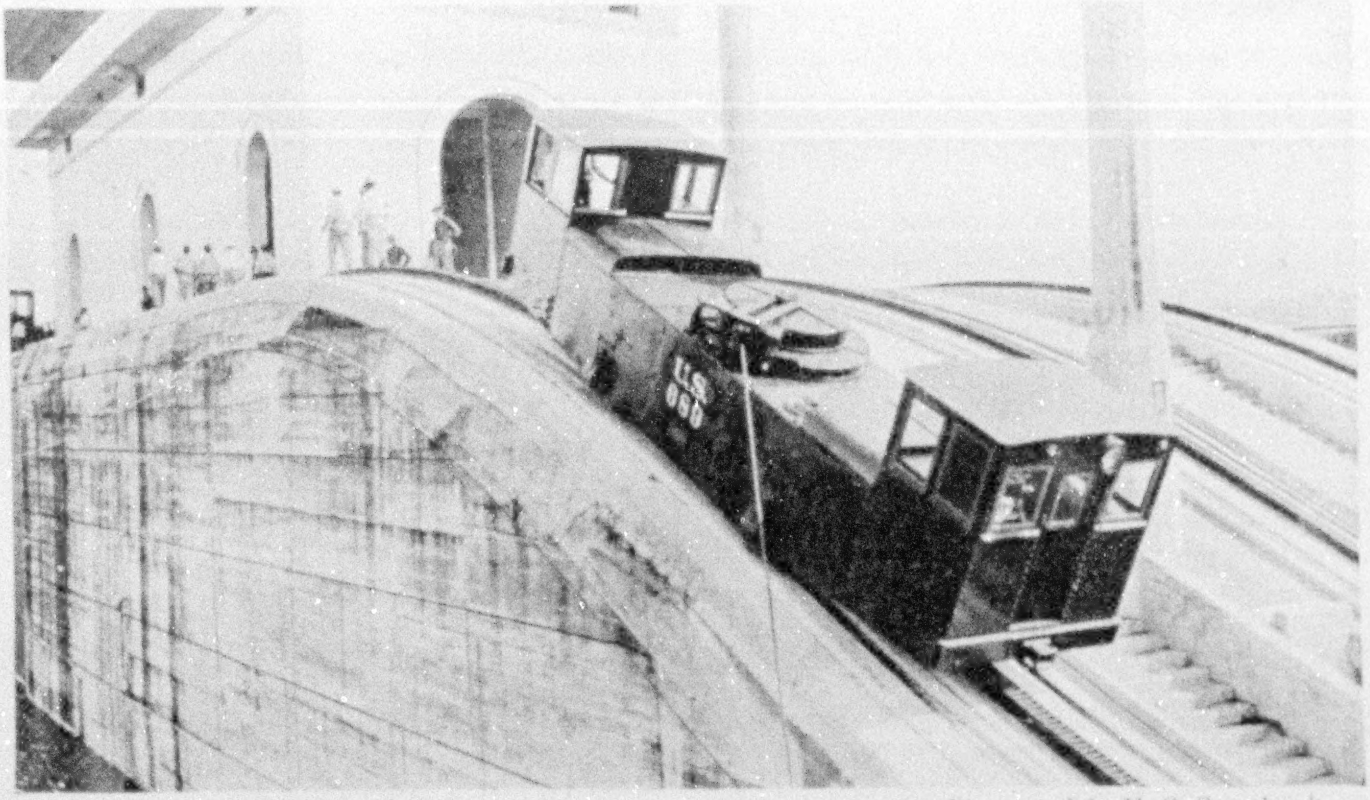
Officially, this pig-pen is accounted for by the best of utilitarian reasons. Figures prove that the animals earn hundreds of dollars for the government annually. But I shall always believe that the originator of the pig-farm was a Middle Westerner with fond recollections of the old farm.

There is something homy and comfortable under this Cuban sun about the grunt of a Duroc Red lady whose small children are gathering sustenance while she sleeps in the shade. Sailors are always standing about regarding this spectacle wistfully.

The corporal of marines who is the official custodian of the pigs has the air of proud importance which might befit a beefeater guarding the Crown jewels in the Tower of London.

CAIMANERA AND ITS ONE THOUSAND ASSORTED SMELLS

And there is, of course, always Caimanera. One thousand assorted smells as-



Photograph by H. G. Cornthwaite

A TOWING ELECTRIC "MULE" CLIMBING FROM ONE LOCK LEVEL TO THE NEXT HIGHER: PANAMA CANAL

Ships are not allowed to use their own power, but are towed through the locks by electric locomotives to prevent accident.

sail the nostrils when one climbs on its rickety boat wharf. Small dogs sleep in the sun or scratch themselves with an irritated vigor rarely manifested by other dwellers of the town.

Little naked gourd-shaped babies permeate the principal thoroughfares and make excellent mudpies between showers. At intervals the Caimanera waterworks is dragged through the plaza on a cart pulled by two goats. Life is leisurely, contemplative, and eminently social.

"Sis's Place" and "The Two Sisters" and "The American Bar" woo thirsty callers by a display of backbars stacked with bottles. There are no fronts to the saloons, so that one pauses on the pavement, so to speak, to wet an arid whistle.

There was a time when the bottles in the backbar were racked with the cork ends outward, but on one occasion an Indian-club swinger practiced his art upon the passers-by. Since then the bottles have been more difficult to reach.

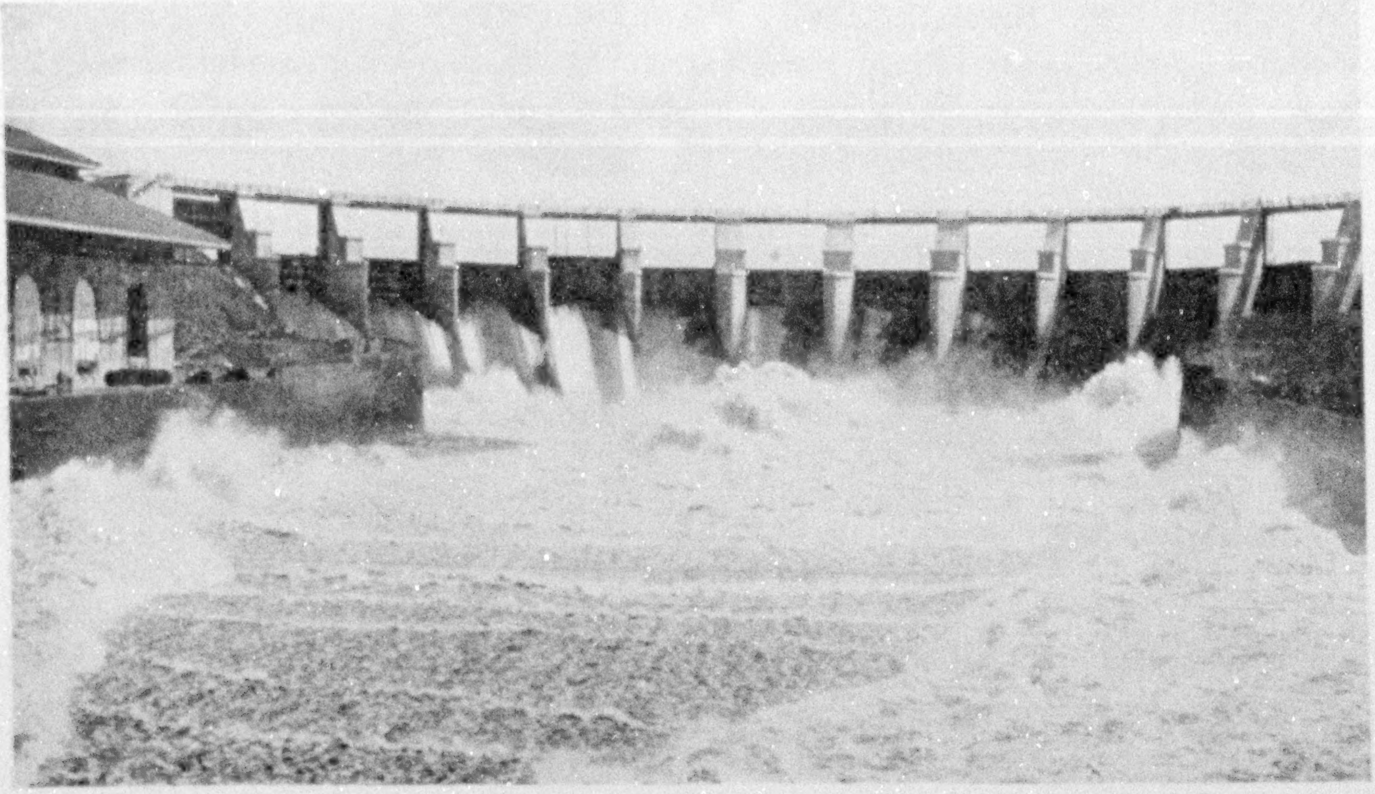
The buildings along one side of the principal street are half supported by piles.

On their verandas, overhanging the water, one sees dark-skinned women dressed in flowing white, languidly fanning themselves as the ship's barge putputs in. All the way up the Guantanamo River the atmosphere has suggested Joseph Conrad's African backgrounds. The dark currents, the violent green of the contorted mangroves that curtain the banks, the "Red Mill" at which a sugar schooner bakes lazily in the sun and near which a solitary saloon is thrust invitingly forward over the water—all have a remote and exotic air.

Near the saloon an American sailor with the black-and-green badge of the shore patrol on his arm roasts profanely. There are various areas in Caimanera which are emphatically out of bounds.

ONE HOUR ASHORE

At Caimanera the officers on liberty—gobs never get ashore here—hurry to Pablo's or the American Club. Every moment is of value. The boats rarely reach the dock before 5 o'clock and they start fleetward at six sharp. Pablo and Toney rain perspiration from their dark brows as they shake 'em up. At either hand stands a crockery pitcher filled with



Photograph by H. G. Cornthwaite

THE GATUN SPILLWAY WITH TWO GATES OPEN, DISCHARGING WATER AT THE RATE OF 20,000 CUBIC FEET PER SECOND: PANAMA CANAL

The spillway regulates the height of the water in Gatun Lake and prevents it overflowing during heavy tropical floods. At times six or more gates are opened at once to take care of big floods. The illustration shows two of the gates open.

the seductive Daiquiri. A boy grinds at the ice-shaving machine in the rear. Pablo and Toney barely have time to make change.

So it goes down the dingy, dusty, sometimes flagrantly muddy street, with its weird multitude of vicious odors. Cubans look at the Americans with a certain reservation. It is not the Cuban temperament to hurry so over a handful of drinks. Nor does the Cuban need to hurry. Big negroes, with the strong features of the Arab, look one squarely in the eye.

Here and there one sees a conical thatch, which lends an air of distinction to the sordid streets of one-story shanties roofed with tin.

On Sundays the cockfight lasts all day long. The owners parade the streets with their sleepy birds under their arms and the laborers throng in from near-by plantations in their newest clothes.

SETTING SAIL FOR COLON

Brightwork was shining and paint was glistening when the fleet set sail for the second leg of its long cruise to Peru.

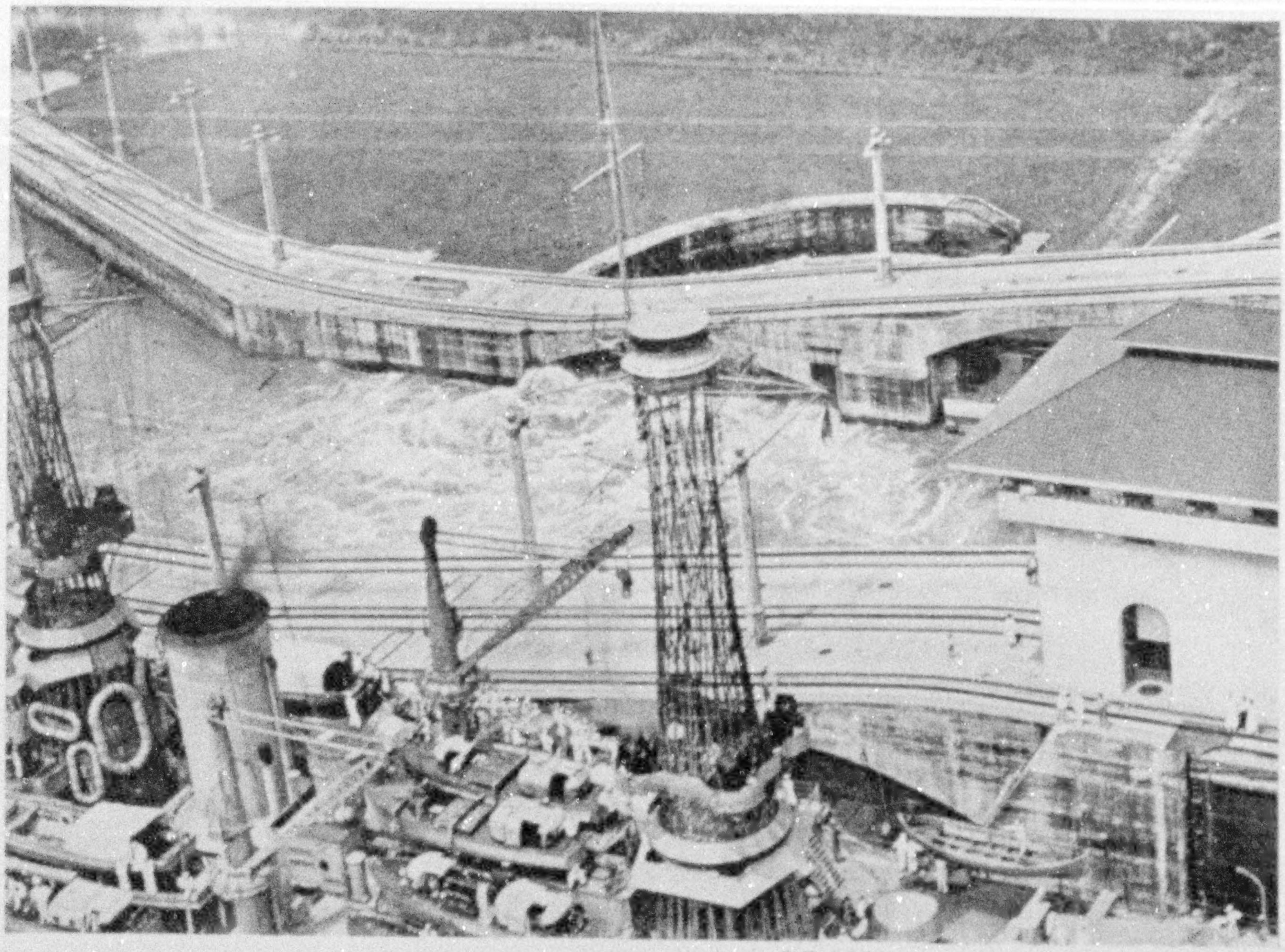
It was a different fleet entirely. The rust of the winter had been rubbed off ships and men alike. The next stop was to be at Colon, at the Atlantic end of the Panama Canal, where the Strangers' Club opens its hospitable doors.

Every writer of Central American fiction has come here to gain color for his narrative. Some have not gone beyond it. Why, indeed, should they, when any day the men drinking at the tables can offer the story of adventures that are incredible and true? One hears of the college man who has turned savage and of the lake that is paved with golden vessels sunk in it to save them from the hands of the Conquistadores——

But I temporarily abandoned the fleet at Guantanamo in favor of the seaplanes. The Atlantic flotilla of F. L. 5's had hopped down the coast from Philadelphia and was on its way to the Panama Canal.

I made my temporary headquarters on board the *Shawmut*, the mother-ship of the airboats.

The *Shawmut* has not lost the habit of rolling she acquired before the war, when



Official Photograph, U. S. Navy Air Service

THE "NEW MEXICO" LEAVING LOCKS IN THE PANAMA CANAL

Close-up photographs of this kind constitute a part of the argument of the aviation advocates, who believe that the airplane is making obsolete the first-line battleships (see "America in the Air," by Brigadier General William Mitchell, in THE GEOGRAPHIC for March, 1921).

she used to carry excursionists down Long Island Sound. It is my conviction that she will roll her rail under if a gob misplaces a tin knife. Maybe I am wrong, but I know what I know.

A DEFENSE OF "GOB"

At any rate, this seems a good place to defend the word "gob." Every naval officer resents its use. Not one will concede there is such a thing or a word as gob. It will be admitted that it does not sound sweet and pretty, any more than "chow" or "hike" or any of the other one-syllabled words that came into use through war. But as the sailors call themselves gobs (and never by any chance refer to themselves as tars or bluejackets or seamen) and unquestionably discovered or invented this name, I submit that they are a sufficient authority.

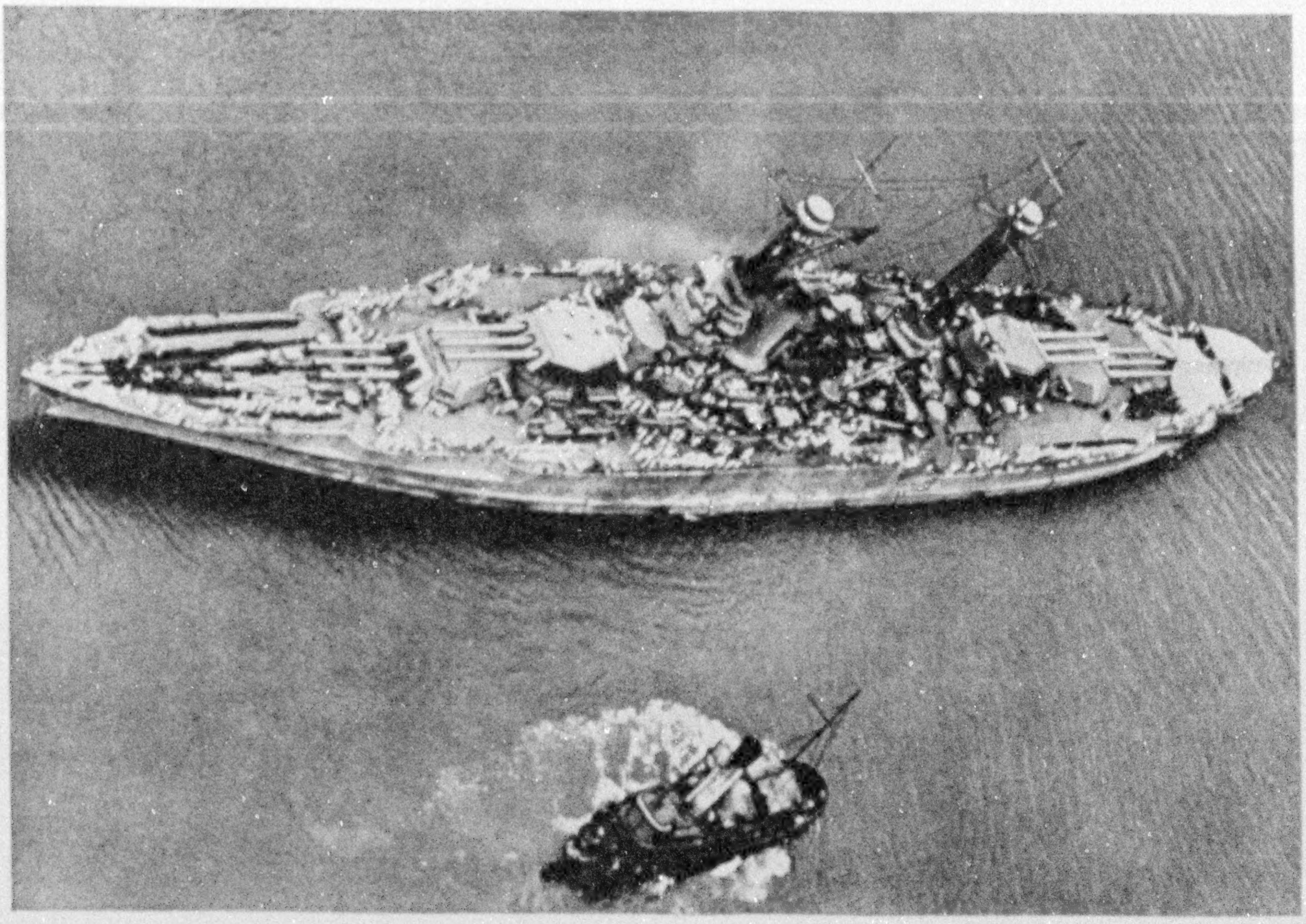
Gold lace may fume, but between decks they will continue to be gobs.

Flying to Jamaica on board one of the seaplanes did not seem a stunt at all. There is something reassuring in the bulk and weight of these giants, just as there is in the apparent indestructibility of a battleship. They are not as large as the N. C. type, it is true, but a boat with a top wing span of 107 feet and which when loaded weighs seven tons is not as terrifying as the butterflies in which one flies over land.

LIKE FLYING ON THE VERANDA OF A COUNTRY CLUB

From my seat in the rear cockpit, with a 330-horse-power Liberty motor rasping at either ear, I looked down the twin lines of massive wing struts and felt as though I were out for a fly in the veranda of a country club.

It was only as we sat upon the *Shawmut's* emotional deck in the calm waters of Kingston harbor that I learned the day had been a bad one for flying.



Official Photograph, U. S. Navy Air Service

AN AËRIAL VIEW OF THE "NEW MEXICO"

This photograph conveys an excellent idea of the arrangement of the four turrets, from each of which three fourteen-inch guns are operated.

Or, rather, the day had been a bad one for alighting. From our 1,000 feet in the air the tiny whitecaps that sparkled below had but added to the beauty of the scene, to my amateur eye. Now I discovered that the airboats, for all their seeming strength, are but fragile things when they measure their forces against those of the sea.

Ten seaplanes began this cruise and only seven reached Colon. Yet every possible care had been taken, and not once did they take the air except when flying conditions were excellent.

"Our trouble," as the commander of the flotilla said, "is that if we make the boats strong enough to be thoroughly seaworthy the craft is too heavy to be forced into the air."

A FLYING BOAT LOST

On the first day of the flight from Kingston to Colon No. 4311 was lost. The air was perfect. There was not a hint of fog, the flying man's bugaboo, and there was a following wind. The squadron's commander, speaking for his adventurers, had begged permission to fly straight through to Colon, a distance of 630 miles. But the flotilla commander had learned conservatism in dealing with the air force. His experience is that something invariably happens if a flight is projected on the assumption that nothing will.

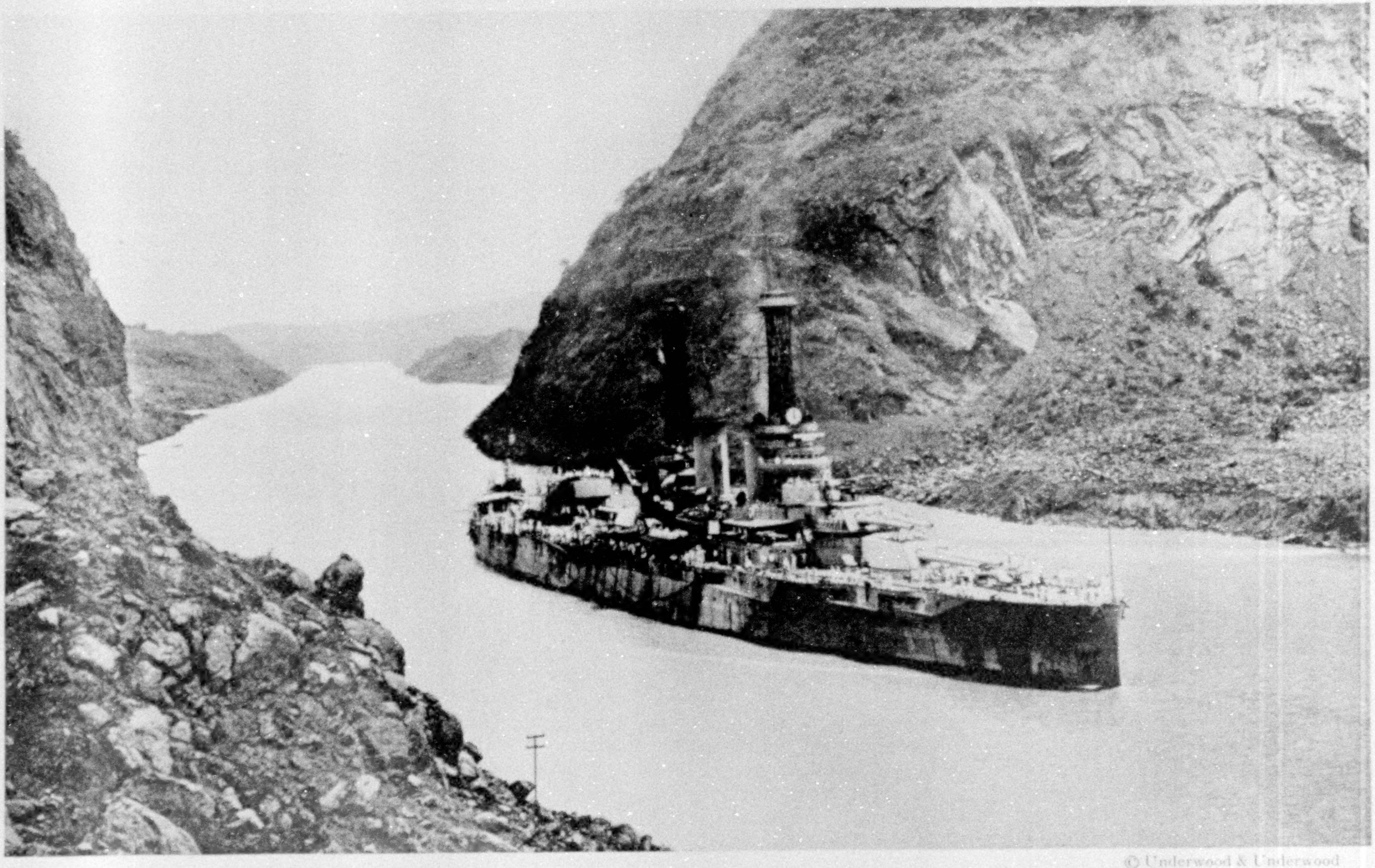
"Old Providence Island is about half way," he said. "We will stop there first. Maybe we will not all get in."

Old Providence Island is 380 miles from Kingston, and next day, as we were rolling blithely along in the *Shawmut*, spilling the dishes over the fiddles whenever a flying-fish kicked up a sea alongside, the wireless began to talk:

"Forty-three eleven is forced down on Sarrana Reef."

We began to hammer through the Caribbean seas.

One began to realize the anxiety that preys continually on every one connected with the flying forces. No one knew what had happened to 4311, but what



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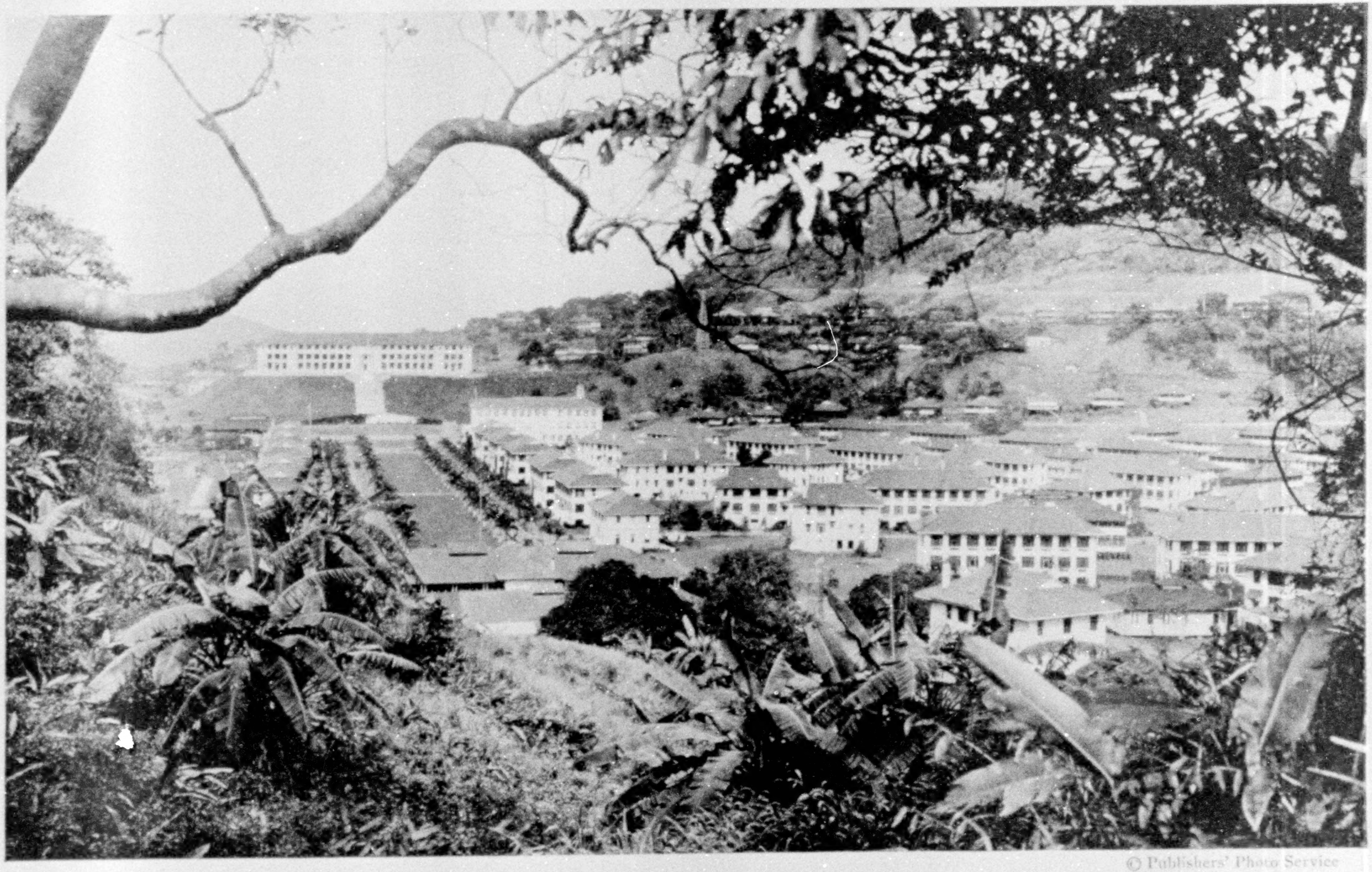
THE "TEXAS" PASSING THROUGH THE GAILLARD CUT, PANAMA CANAL

The *Texas* became a unit of the American Navy the year of the outbreak of the World War. It has a main battery of ten 14-inch guns and a secondary battery of sixteen 5-inch guns, with four 21-inch torpedo tubes.



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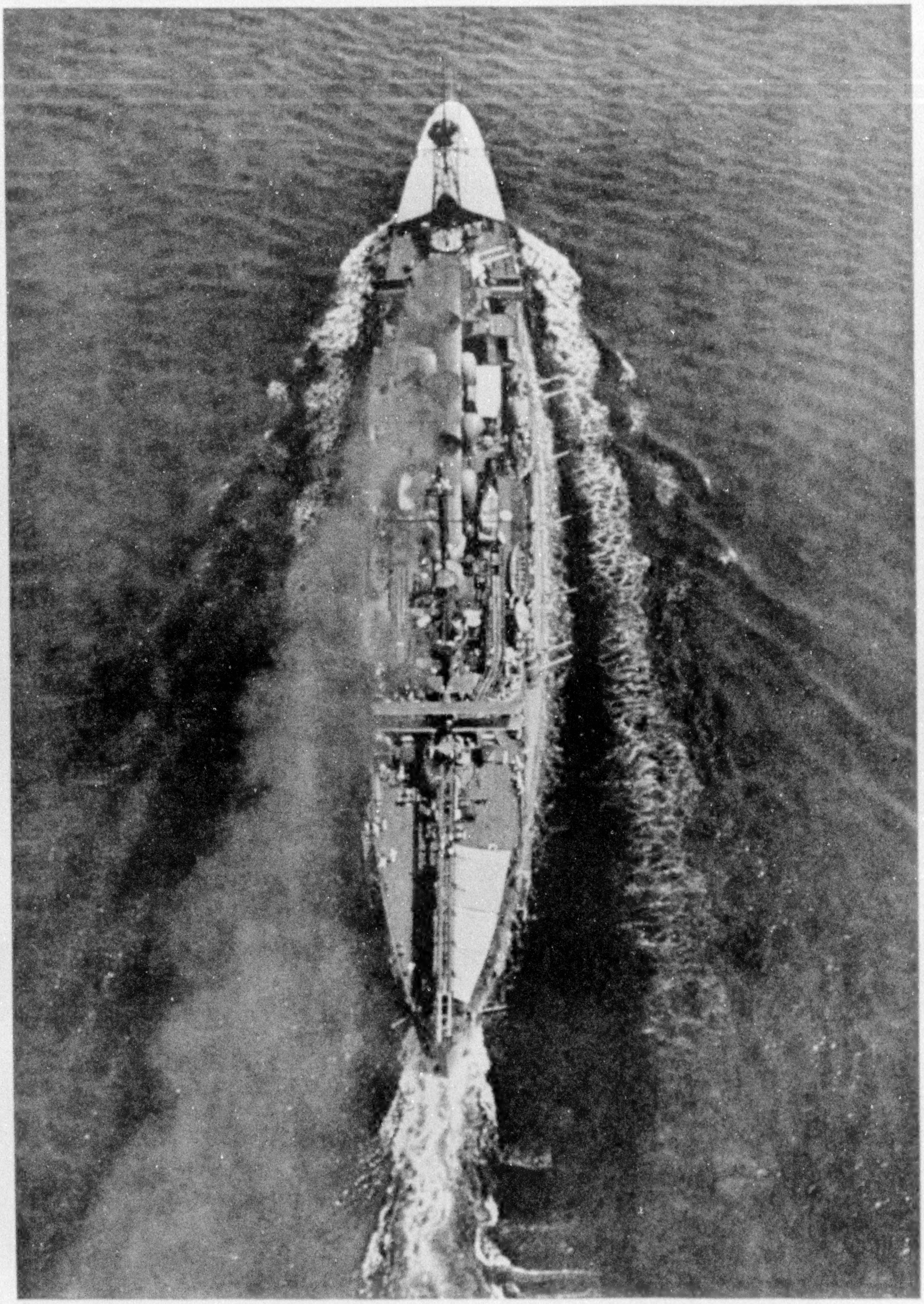
BALBOA, THE SEAT OF UNITED STATES GOVERNMENT IN THE PANAMA CANAL ZONE

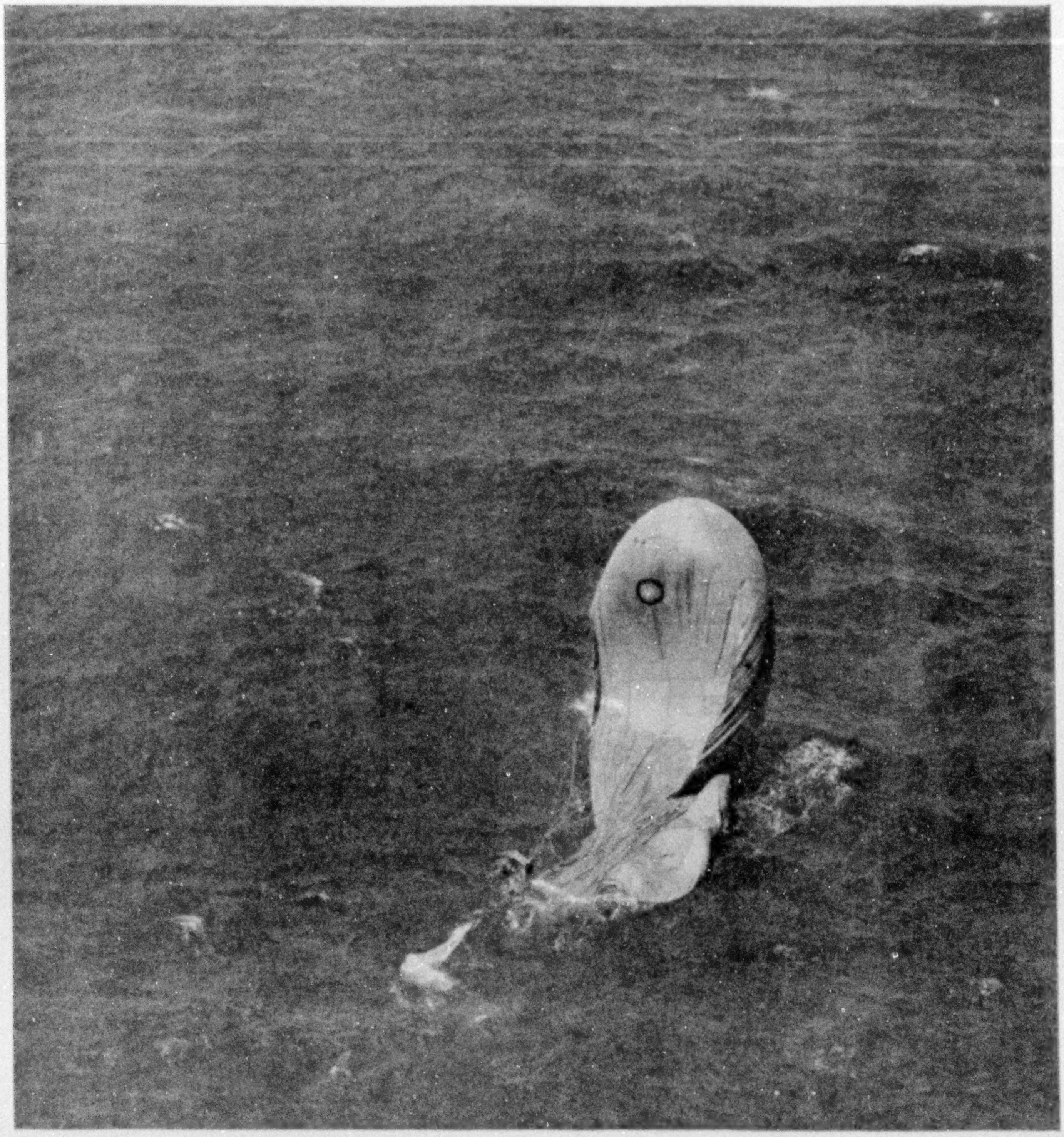
Balboa and its adjacent community, Ancon, make an ideal residential city with wide, well-lighted streets, and spacious houses with wide, screened verandas. The United States Government operates all the commissaries and restaurants, and owns all the houses, which are occupied by the canal operatives and their families. The large building on the hill is the administration headquarters.



Official Photograph, U. S. Navy Air Service

THE AMERICAN ARMORED CRUISER "HUNTINGTON" AS SEEN FROM A KITE BALLOON

In addition to its target range, its naval and aviation base, Guantanamo has a balloon school, but the neighborhood has proved perilous for the "sausages." Three were brought down by lightning at this station last year.



Official Photograph, U. S. Navy

OUT OF ITS ELEMENT: THE FLOATING WRECK OF A KITE BALLOON

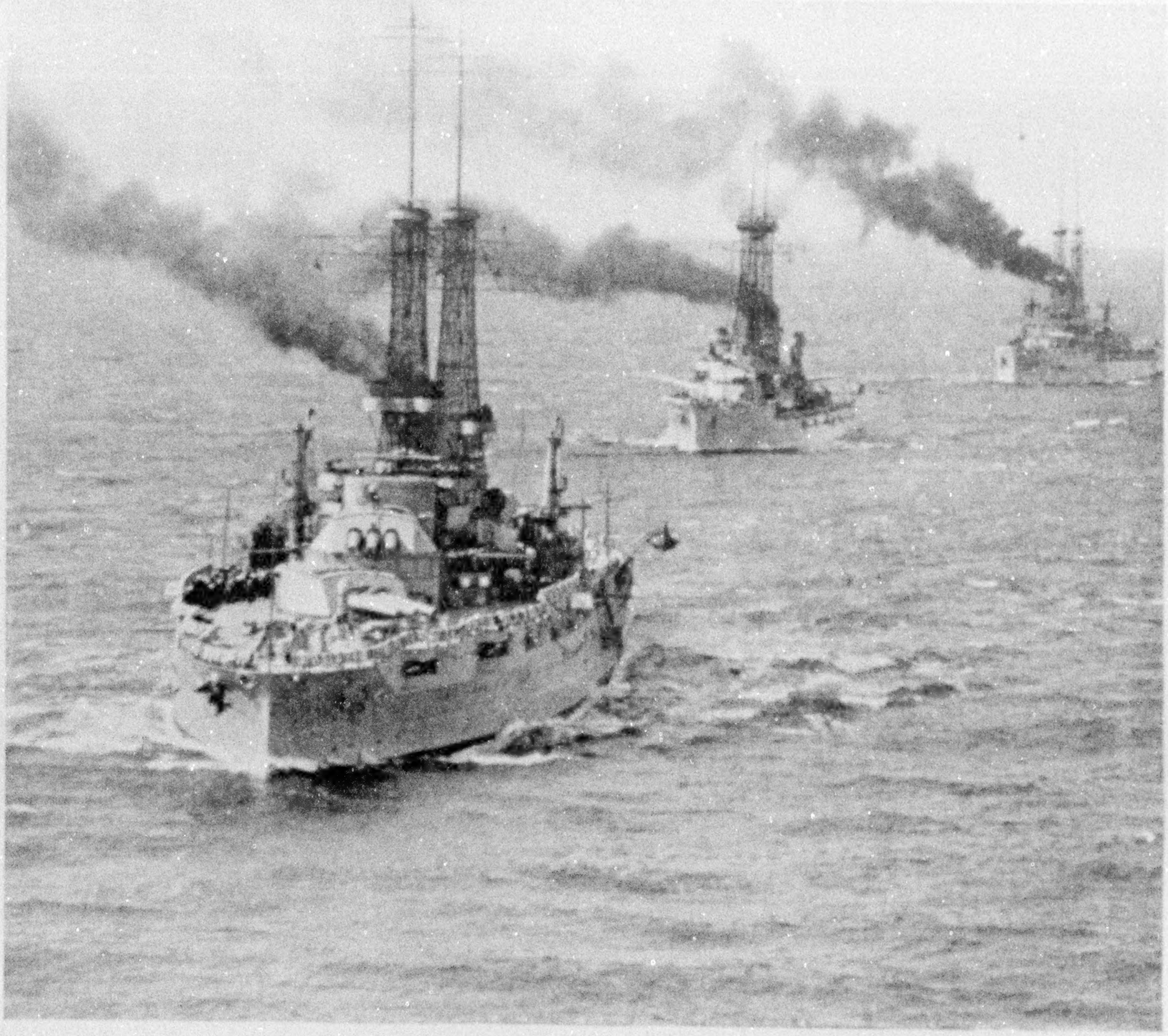
every one did know was that no seaplane can last long in even a trifling sea.

Just a few days before one had been forced down in a choppy little tangle of water—the sort of sea a dory would make nothing of at all—and her body had snapped square in two.

That sort of an accident had never happened before. Her mate alighted on the water in an attempt at rescue and her body snapped. The crews of the two planes had only been saved by a combination of miracle and calm American courage.

The wireless caught a little now and then, first from 4311's radio and later from the destroyer *Hatfield*, which was standing by. The seaplane had found shelter under Sarrana Banks and might, possibly, be saved.

Her mate, No. 3681, was flying overhead, as a fishhawk might circle over a wounded mate, but she was ordered on to Old Providence. There was nothing that she could have done, in any case. If 4311 had gone to pieces and the *Hatfield* had not been at hand, 3681 must have flown overhead and watched the



© Burnell Poole

THREE UNITS OF AMERICA'S FIRST LINE OF DEFENSE

The United States Navy has sixteen first-line battleships now in commission; the seventeenth (*Maryland*) and eighteenth (*California*) are completed, but not yet in commission. There are nine other first-class ships whose keels have been laid and are now building.

five men drown in the Sarrana's waters. An attempt to alight would have sacrificed her own crew.

TRYING TO SAVE A CRIPPLED SEAPLANE

A day of full steam ahead brought the *Shawmut* to the Sarrana Banks.

This is a hopelessly desolate bit of land. There is no fresh water on it, no food, no trees, no grass, no men. At one end an automatic, self-acting lighthouse blinks day and night on its three months' charge of carbide. All around a nasty sea kicks on hidden rocks.

The Sarrana reef was last charted by a British ship ninety years ago, and the depths have so changed that the inner circle of the reef is a trap for ships. But it had saved 4311. Without its shelter the plane must have gone to pieces and its five men drowned before help arrived.

Successive bulletins had told the *Shawmut* that the port overhang of the 4311 was smashed, the aileron had gone, and that the tower shaft was out of commission. There was nothing to do but send for Captain "Bill" and his own variety of first aid, which he carries

Official Photograph, U. S. Navy Air Service

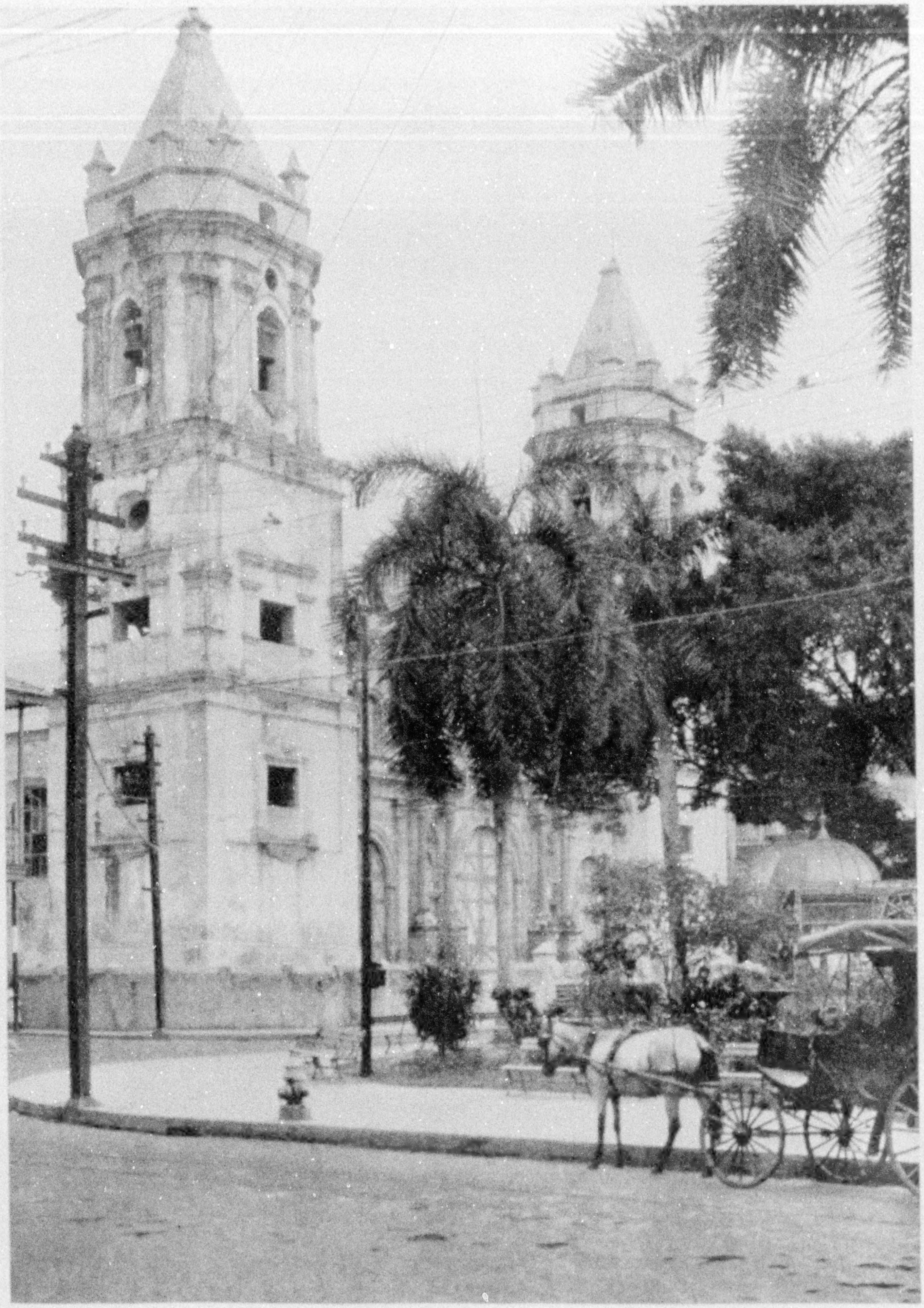
TWENTY-ONE AMERICAN DESTROYERS ANCHORED OFF BALBOA, PANAMA CANAL ZONE

The United States Navy's destroyer fleet consists of 281 vessels of the first line and 21 of the second line. The average destroyer of the first line is from 310 to 314 feet long, has a speed of 35 knots, is equipped with four 21-inch torpedo tubes, and has a complement of eight officers, eight petty officers, and 106 men.

on the mine-layer *Sandpiper*. Captain "Bill's" specialty is in doing things that have never been done before, which is of value in the airboat service, because things are happening there that have never happened before.

The *Sandpiper* is one of the neatest and sturdiest craft imaginable. She has a wide fantail aft and a neat round body which tapers into an impertinently sharp nose. Captain "Bill" would cheerfully undertake to drive her through the Gobi Desert if called on.

On the decks of the *Sandpiper* a miniature dry-dock is carried. That was gotten overboard and the hurt plane loaded in the well. But it did not reach port. There was no bad weather—no particularly bad weather—but the waves snapped the wings off and finally destroyed the plane. It was a mere incident of airboat flying. The flyers hope



Photograph by Earle Harrison

A CORNER OF THE CATHEDRAL PLAZA, PANAMA CITY, THE HEART OF THE REPUBLIC

It was in this plaza that the people proclaimed their independence from Spain more than a hundred years ago, and from Colombia in 1903. The cathedral dates from 1760.

that some day they will be given a motor that will never stop, and so they will be absolved from the necessity of carrying a burdensome boat.

OLD PROVIDENCE, WHERE IT COSTS NOTHING TO LIVE

One wonders what the inhabitants of Old Providence Island thought when the seven remaining airboats of the flotilla swooped down to wait for news of the foundered plane. No airboat had ever been seen before in that part of the world.

The crews perched in their tiny cockpits, unable to go ashore because of fleet quarantine regulations, and looked longingly at the land.

Old Providence is four miles long and eleven hundred feet high and everywhere is a vivid green. Sometimes a little yawl brings mails and canned goods from Colon. This does not often happen.

"How much does it cost to live here?" the flyers asked of the port official, who was paddled in a dugout to give them pratique. Over his head he held a yellow umbrella. In one hand he fitfully agitated a small yellow flag.

"Why, nothing," said he, puzzled.

All day long the flyers sat in the shifting shade of the upper wings, as their planes bobbed on the placid water, and smoked many angry cigarettes.

But Old Providence did its best to entertain them. The brown belles and beaux paddled out to chat. Small, naked boys did perfectly unbelievable feats of swimming and diving for pennies. Large family parties were rowed out in sturdy boats. The most delicious oranges and bananas the Americans had ever tasted were offered at infinitesimal prices. But of the romantic island of Old Providence the flyers thought only as of a place in which they had been marooned.

"Gee," they reported. "We were glad to get away."

THE MARVEL OF THE CANAL TAKEN AS A MATTER OF COURSE

It is doubtful if Young America, as represented 'tween decks, fully appreciated the marvel of the Panama Canal as the warships passed through its great locks. They were immensely interested, of course. One could see the fighting tops of the great ships white with sailors. Their decks seemed to have been whitewashed, so thickly had the men gathered to gaze overside at the electric mules and the lock mechanisms (see page 592).

But most of them had been fed for the better part of their lives with stories and pictures of the canal. They took great achievements as a matter of course, as all Americans do. Nothing seems impossible or even improbable to them.

The boys commented wisely on the various mechanical gadgets used in the canal operation, but the thing that really aroused their enthusiasm was the zone's flylessness.

This was within the range of their every-day knowledge. Every boy born on a farm or reared in a village knows of the plague of flies and mosquitoes the summer brings. All knew that the tropics are the happy home of every bug that flies or creeps. Yet they saw the Canal Zone—this green ribbon which unites the two oceans in the very heart of the tropics—as clean and shaven and bugless as though it had been painted on a backdrop.

For one question I heard about the building or operation of the canal I heard a dozen about the process of getting rid of winged pests.

"We're a pretty smart people at that," was one boy's conclusion. "We can get rid of them whenever we really want to."

THE TWO FLEETS JOIN

It was at Panama that the Pacific fleet joined that from Atlantic waters, and the combined fleets steamed for Peru and Chile in company.

The greater part of each day was occupied in what were called maneuvers, but were really tactical exercises. The purpose was to accustom the deck officers of the various ships to work in concert.

The spectacle of more than sixty ships of war moving in harmony was a superb one, but it was not until it was announced that the fleets were to have night battle practice that the real thrill came. That night I was leaning over the port rail in company with an officer.

The night was one of soft blackness. Not a star was reflected in the placid sur-

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ABLUTIONS AL FRESCO: A STREET SCENE IN PANAMA CITY

face of the Pacific. There were no lights visible, although one knew that somewhere fourteen battleships and thirty-six destroyers were playing the war game together. There was not a sound except the rustle of the water thrust back by our blunt prow.

Suddenly my eyes became aware that a sinister shadow kept silent company with us. At first it seemed only a blob of deeper black. At last I realized that a destroyer was so near by that I might have tossed a biscuit aboard. For the first time I fully realized the deadliness of the boats.

"Why do we not fire on her?" I asked my companion.

"We were sunk ten minutes ago," said he. "We're out of action."

At Panama the heat had been blistering, as the ships lay at anchor, under the protection of the cluster of round islands that will eventually be fortified for the protection of the canal mouth. The protection is a perfect one. No ship of war can ever hope to get between the meshes of that screen of islands, although the canal remains as undefended from aircraft as is every other secret place in the world.

But the moment the start was made for waters farther south a cool breeze searched the most remote corners of the ships. Even the old-timers found it difficult to adjust themselves geographically. We were bound "up south" and leaving the warm neighborhood of the isthmus for the delicious coolness of the Equator!

In the distance we later saw the green shores of Colombia and Ecuador, visible on the horizon as faint lines of cloud.

The farther south the fleet traveled, the more delightful became the temperature.

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A BANANA-LADEN DUGOUT CANOE ON GATUN LAKE, PANAMA

The faintest of breezes ruffled the calm water, so that one might sit all day upon the quarterdeck without the pages of one's book so much as fluttering.

At night the stars were barely over the mastheads and vividly bright. A luminous lane led straight over the waters to Venus, which gleamed with such an emphasis of light that the first words of the newcomers to the deck each night were usually addressed to the Queen of Beauty.

LIGHT OVERCOATS AT THE EQUATOR

The sailors spent hours in identifying the constellations, although in northern latitudes they had not paid a moment's tribute to the heavens.

When the neighborhood of the Equator was reached, light coats were needed at the evening movie shows. The sailors who clung to singlets clotted in the neighborhood of the engine-room hatches, from which a warm and pleasant current was always flowing.

For this reversal of the expected the Humboldt Current was responsible. This may not be quite as remarkable a phenomenon as the Gulf Stream is on the other side of the continental wall, but its effects upon South American conditions are hardly less marked. It has actually shoved the South Temperate Zone north; so that while the vicinity of the Equator should be the warmest place in the world, it actually is not.

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THE FRUIT MARKET ON THE BEACH AT PANAMA CITY

This deep, cold current sweeps the depths of the sea and brings up algæ that are foreign to these latitudes. The fish follow the algæ, and the birds follow the fish. Penguins which belong in the Antarctic Circle are living happily off the coast of Peru.

Much of the wealth of Peru is derived from the guano beds produced by the guano-birds, which are estimated to have an actual value to the state of $15 per pair. The giant condor, which lives at a chilly altitude of 15,000 feet, is able to swoop down to sea-level to prey on guano-birds, thanks to the temperate influence of the Humboldt Current.

But to the old-timers—the flat-feet—these are the Horse Latitudes and the Doldrums. They had many stories to tell of ships becalmed here for weeks, in spite of the whistling of the bos'ns and the throwing overboard of silver money and the affectionate pampering of such Finns as might be on board.

CROSSING THE LINE

Sometimes, though not often, an albatross was sighted. Nor were sharks as numerous as the greenhorns had supposed.

After all, the chief interest at this time was in the arrival of Neptune and his courtly party. The men who had crossed the Line before talked of little else for weeks. In every dark corner Neptune and his courtiers swore gruffly at landlubbers who tried to overhear their deliberations.

Costumes were being made and tried on behind locked doors. Some had been brought from New York and some were a part of the permanent equipment of the ship. Most of the dresses of ceremony had been bought at Panama, however, where the Chinese shopkeepers do a regular business in purveying starry crowns for Neptune himself, and the latest and most shameless lingerie for Amphitrite.

One or two of the younger and prettier seamen were seized upon for pages to be decked out in long silk stockings and permanent blushes. No one was more unhappy aboard than these pages in the days just preceding that of the ceremony. An exception may, perhaps,

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THE MUNICIPAL MARKET IN PANAMA CITY

The "Ditty Box Guide Book," which was given to every member of the fleet before landing at Panama, gives this version of the origin of the nickname "spiggoty," applied by Americans to the natives of Panama: "When the Americans first arrived on the Isthmus the cab-drivers would shout, 'Me speak it, the English.' This soon changed to 'spickety,' and then to 'spiggoty.' Thenceforth the Panamanians were 'spiggoties.'"

be taken to that statement. No doubt the most unhappy man was the greenhorn who permitted himself to be frightened by the heartless old tars, who told of Neptune's severity.

"How is your heart?" they would rumble to the young man from the prairie town, who had never even heard of Neptune before he went to sea. Horny hands would feel the frightened flutterings of the victim's breast.

"You may get through," the amateur diagnosticians would say. "I dunno. It's pretty weak. Hey, Tom. C'me here and feel this guy's heart!"

THE GREATEST LEVEE NEPTUNE EVER HELD

This was certainly the greatest levee that Neptune ever held since he began his practice of climbing over the bows of ships as they cross the Equator. Not less than 25,000 men appeared before his courts on the sixty-odd ships. The total was probably greater, for it was estimated that not more than 5 per cent of the 31,000 men on the combined fleets had ever crossed the Line before.

On the night of January 23 the Herald came aboard. Up to this moment the promised ceremony had seemed distant and humorous. Now it took on an air of dignity. One felt that this fine old tradition of the sea would be upheld in a proper spirit. The ships had been jogging placidly along, when from our foretop came a frightened hail:

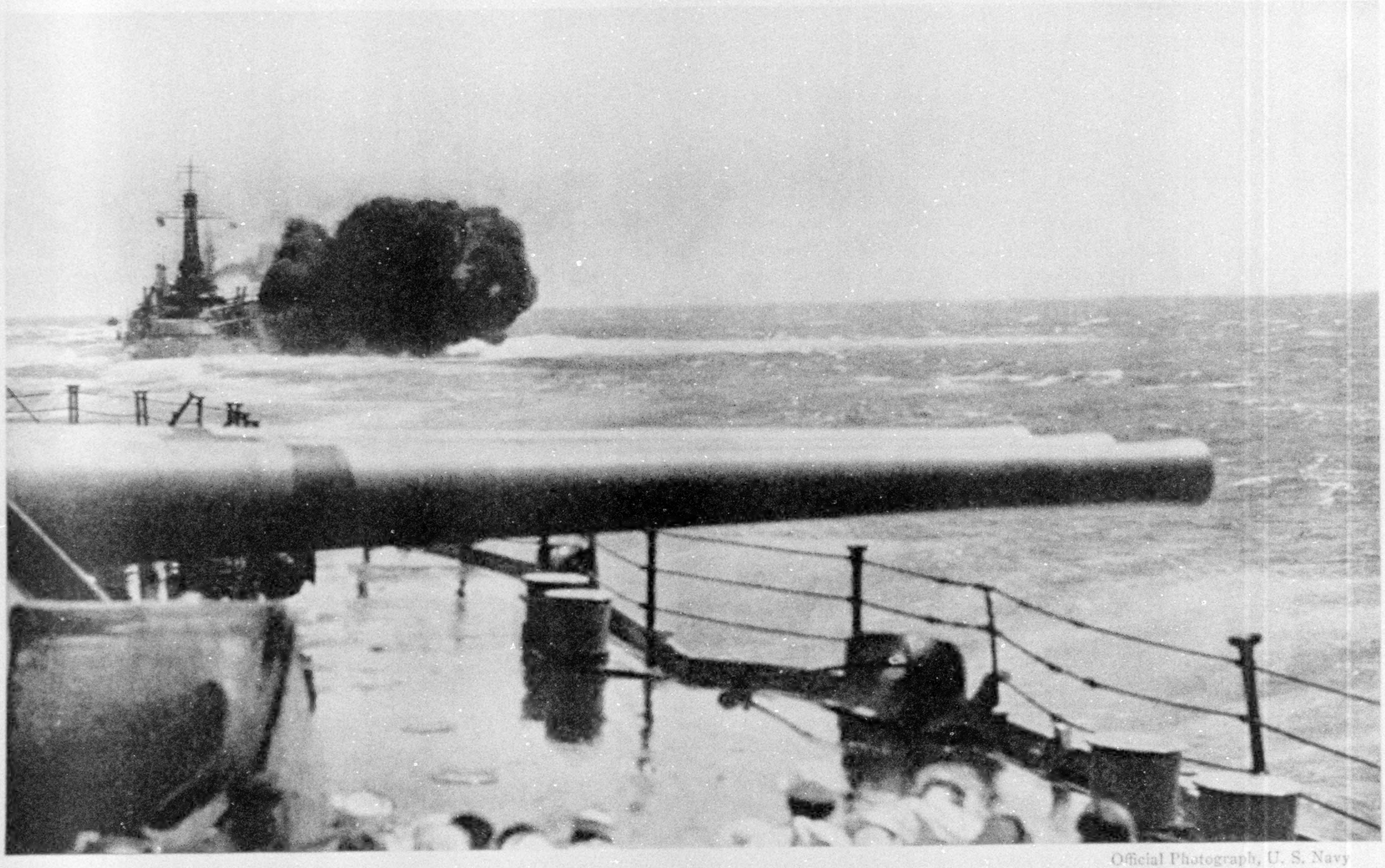
"Light ho! Light on the starboard bo-ow."

At first the men who rushed to the rail thought the light was from one of the life-rings equipped with lamps, for use when men go overboard on dark nights. But it was seen to be a flare set adrift in a tub from whatever ship was

Official Photograph, U. S. Navy

"THE FARTHER SOUTH THE FLEET TRAVELED THE MORE DELIGHTFUL BECAME THE TEMPERATURE"

In practice cruises it is not only the constant "march and countermarch" of the ships that is watched, but the amount of smoke which issues from the funnels of each ship. Good engineering means no plumes of smokes.

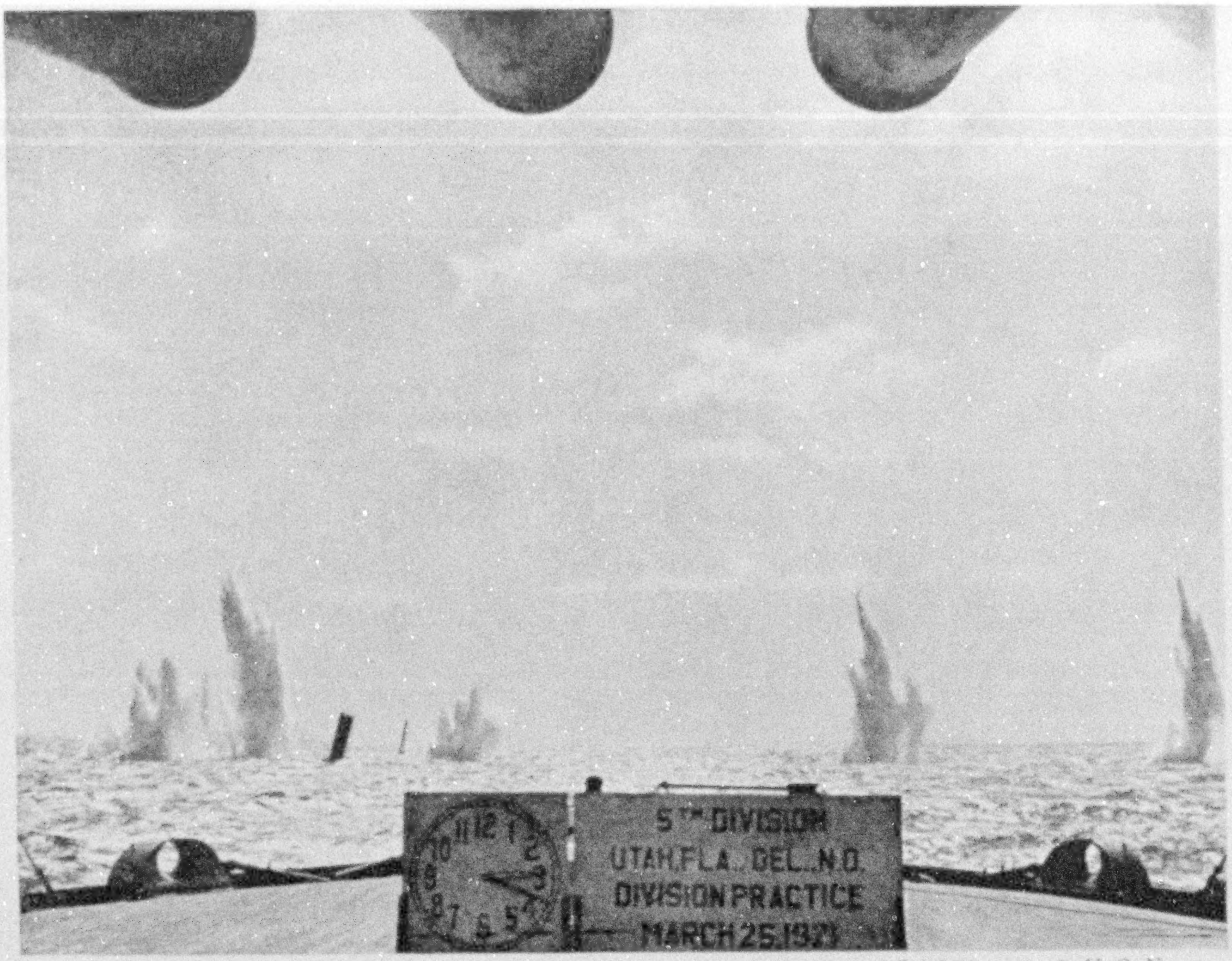


Official Photograph, U. S. Navy

THE "NEVADA" FIRING HER FOURTEEN-INCH GUNS

In the extreme foreground note the heads of the men of a sister ship watching the gigantic plume of black smoke emitted from the muzzles of the great guns.

XUM



Official Photograph, U. S. Navy

SPLASHES FROM GUNFIRE: TARGET PRACTICE AT SEA

To the layman these splashes seem uncomfortably close to the observation ship, from which the photograph was taken. Note the muzzles of the big guns at the top of the picture.

at the head of the long line. As it fell astern, a hoarse voice was heard from the bridge and a masquerader in spun-yarn wig and whiskers cried that at 8 o'clock of the following morning Neptune would come aboard.

The formula is unvarying. In all the years and on all the thousands of ships the wording has hardly changed.

SHIPS SURRENDERED TO NEPTUNE'S NAVIGATOR

So, at 8 o'clock of the morning of January 24 every ship in the fleet checked her way, while a ponderous figure, topped with a gilded crown, climbed aboard from the chains and marched down the deck at the head of his crew.

The men grinned at Neptune and Amphitrite and the court jester and the rest, of course. That is American fashion.

For all that, there was an element of solemnity as well as of fun in the ceremonial. It seemed to link these youngsters with Drake and Morgan and the others who first sailed these seas.

The captains turned over their ships to Neptune's navigator, who took the bridge. The crew moved to the forward decks, where the tanks had been built. The court criers began to read the names of those who had never crossed the Line before.

Ordinarily this performance is somewhat drawn out. When there are but two or three to admit to Neptune's realm the monarch's ingenuity is taxed to give them a fitting initiation. But Neptune had too much work before him on this occasion to give his humorous inclinations free rein. On some of the battleships 1,400 men were to be ducked, and few vessels had fewer than 200.

Only the first two or three victims heard the speeches put in Neptune's mouth by tradition. After that quantity production was the rule. The courtiers and dentists and doctors roiled up their sleeves and fell upon the neophytes.

Photograph by Herbert Corey

FATHER NEPTUNE AND HIS COURT ON BOARD THE "BLACK HAWK"

Probably never before in the history of the sea has Neptune held so great a levee as when the Atlantic and Pacific fleets of the United States Navy "crossed the Line" on the trip to Peru and Chile. Not less than 25,000 men appeared before his courts on the sixty-odd ships.

"What's your name?" Neptune would growl.

As the unfortunate opened his mouth to reply a nauseous pill of grease was slipped between his teeth. The barbers slashed at him with a huge brush covered with a lather of flour paste and shaved him with a wooden razor. He was tripped in the barber's chair and spilled backward into the tank six feet below.

The bears seized him, thrust him under water half a dozen times, swung him to the deck again, and turned, perspiring, to catch the next apprentice as he whirled head downward through the air toward the floury waters of the tank.

The extraordinary feature of the visit of Neptune was yet to be seen. In the effort to give a proper scenic investiture to their rôles, those of the flat-feet who had been chosen for the parts of courtiers had permitted their beards to grow.

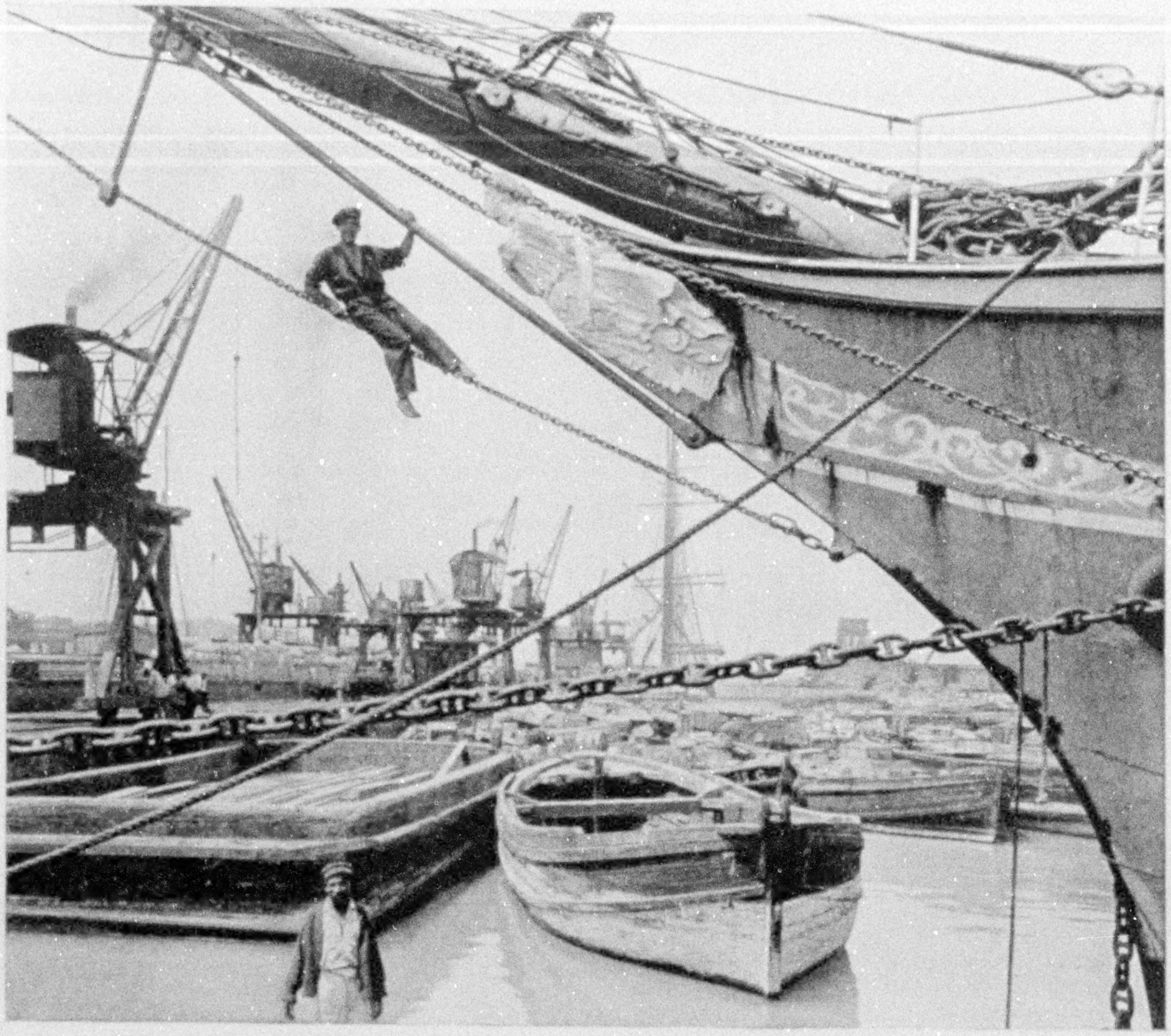
Later on it seemed they could not give them up. They tortured their whiskers into new and strange shapes. They wore them as torpedoes and paint brushes and little dabs of hair high up on the cheek-bones and as galways and burnsides. People turned upon the street in Panama and Lima to gaze after them, and the enraptured gobs thought of new ways in which to train their hirsute adornments. It may be they are still bearded, but I doubt if their mates have resisted temptation.

THE FLEETS SEPARATE

South of Callao, Peru, the two fleets separated for a time. The Pacific fleet went on to Chile, while the Atlantic fleet turned back to Peru. Both were to pay visits of ceremony.

The vessels comprising the Atlantic fleet coasted along this extraordinarily arid coast whose brown dryness is in such contrast to the tropical verdure farther north.

Both Chile and Peru are bordered by a belt of desert country, lying between the Andes and the sea. Here the Andes have three separate crests, which act as compressors in squeezing the last drop of



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THE HARBOR OF CALLAO, PERU, WHERE THE ATLANTIC FLEET PAID ITS CALL OF COURTESY

Chief seaport of Peru, Callao is also the gateway to the capital, Lima, situated seven miles inland. It is a town of 30,000 inhabitants, mainly Peruvian, but with a goodly sprinkling of Indians, Japanese, and Chinese. The American fleet was fortunate in visiting the city sufficiently early in the year to avoid "the painter," an unpleasant odor which fills the harbor in March and April. The phenomenon is attributed by some to the remains of innumerable small dead fish brought in by the tide.

moisture out of the breezes which sweep up the Amazon Valley from the Atlantic. Once in seven years, or thereabouts, a little rain falls in the dry belt.

For years Peru accepted this condition without demur. There were advantages in the absolute dryness of the air.

Not far from Lima is a buried city, four thousand years old, in which the houses were built of unburned clay. Their fronts were molded in crude designs by the Indian architects, and the tracery has remained unharmed by the passage of years. Bodies of animals found on the plains have been mummified without decay.

One would think that some one would have reasoned that cities cannot exist without water, and that there are abundant evidences to prove that at one time this coast was extremely populous. But no one did.

PUTTING ANCIENT IRRIGATION DITCHES TO WORK AGAIN

Then a foreigner made a discovery. Wandering through the arid region, he saw what he thought might be the remains of ancient irrigation projects. A little investigation convinced him that he had under his eyes a complete irrigation system, built by the Incas or their prede-

Official Photograph, U. S. Navy

MEN OF THE AMERICAN FLEET IN THE STREETS OF PERU'S CAPITAL

It was a cordial welcome which Lima extended to the representatives of the northern republic; even the motion-picture theaters were specializing in American films; but the great show staged for the benefit of the visitors was the bull-fight, held in the largest bull-ring in the world.

cessors, which had but to be cleared of the accumulated sand to function again as perfectly as in the Incan days.

He paused long enough to buy a large tract from the Peruvian Government, and then cleared out the old ditches and turned into them the water that had been flowing down from the hither slopes of the Andes to lose themselves in the desert sands. Today he has one of the greatest sugar estates in the world, and every main-line ditch is just as it was first surveyed and excavated thousands of years ago by a people we are apt to think of as savage.

The Peruvian Government was not slow to take the hint. It has been slow to act because of financial conditions, but today an American engineer is in the employ of the government tracing out the lines of the ancient Inca systems. They are complete and practicable, and need only to be cleared of sand to restore to fertility the thousands upon thousands of acres which were once cultivated here.

As one ascends the Andes the rainfall increases, until on the other side of the triple summit a typical tropical jungle is to be found. But on this arid plain, for years dismissed as a useless desert, are to be founded the great farming projects of the immediate future in Peru.

A CORDIAL WELCOME FROM PERU

The Atlantic fleet entered the harbor of Callao, which is the principal Peruvian port, on January 31, and a week of good fellowship followed. One soon ceased to be cynical about the Peruvian welcome, or to look behind it for any motive of self-interest.

Every Peruvian one met said and seemed to feel that the United States is the great and good friend of his own

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SPINNING YARN FOR PONCHOS IN THE HIGHLANDS OF PERU

The progressive president of the Peruvian Republic finds that his greatest difficulty in advancing the prosperity of the Indian element of his country's population is the absence of a sense of "the need for something." The Indian of Peru wants almost nothing that he cannot produce himself. His little garden supplies him with food and the wool of a sheep or two provides his wardrobe.

republic. President Augusto B. Leguia voiced what appeared to be the sentiment of the nation:

"In all our dealings with other nations we have found the United States the only one whose actions have not been dictated by selfish interest," he said.

There is a startling absence of ceremony, too, in spite of the gold lace and elaborate trappings in which the officials of state came to pay their formal call upon the officers of the fleet. This little ceremonial was quite the equal in form and color of those one is accustomed to seeing in the European states.

The green and gold carriages in which President Leguia and the members of his cabinet drove through Lima's narrow streets glittered with plate-glass. A troop of cavalry clattered in front of and behind them.

A CALL UPON THE PERUVIAN PRESIDENT

But when I desired to call upon the President of Peru I was admitted to his presence without a tenth of the delay one expects to encounter in trying to enter the office of a country banker.

"I want to go to the office of President Leguia," I told the Indian non-commissioned officer in command of the half dozen soldiers at the door of the palace, across the great plaza from the cathedral in which Pizarro's bones lie in rather doubtful state, in a glass-sided casket which every visitor to Lima sees.

The non-commissioned officer waved me on. I crossed the wide patio and found another and was again waved on. Eventually I reached a secretary, who spoke English and left me contemplating the red Turkey carpet and gold-legged chairs which are the invariable properties of a state chamber in Latin America.

Along one side, an open gallery shaded the president's office. From it one could look into a dusty and faded little patio, in which a few discouraged bushes struggled against the prevailing lack of water.

"Come this way," said the secretary.

President Leguia seems a sort of a Hoover in his own country. He is a slender, quick-spoken, frank-eyed man who made a fortune in business before he thought of entering politics. He speaks English very well, too, thanks partly to early training and partly to the fact that after he had been "revoluted" out of office and exiled he made his home abroad for some years. He is now engaged in trying to modernize his country, and to this end is engaging school teachers and surgeons and administrators and engineers from the United States.

DESIRE THE SECRET OF PROGRESS

"I believe," said he, "that the first step in progress is to need something."

There is no more docile, biddable, kindly man in the world than the Indian of Peru. But he wants almost nothing that he cannot produce himself. He usually holds a little "tierra" which has come down to him from his forefathers and which had been assigned to them by Inca law.

The produce of his little garden feeds his family, and the wool of a sheep or two, spun into yarn and woven into cloth by his wife, provides the domestic wardrobe.

A few pots are his household furnishings, and he sleeps at night in the blanket he draws around his shoulders by day. There seems almost no reason why he should work for money.

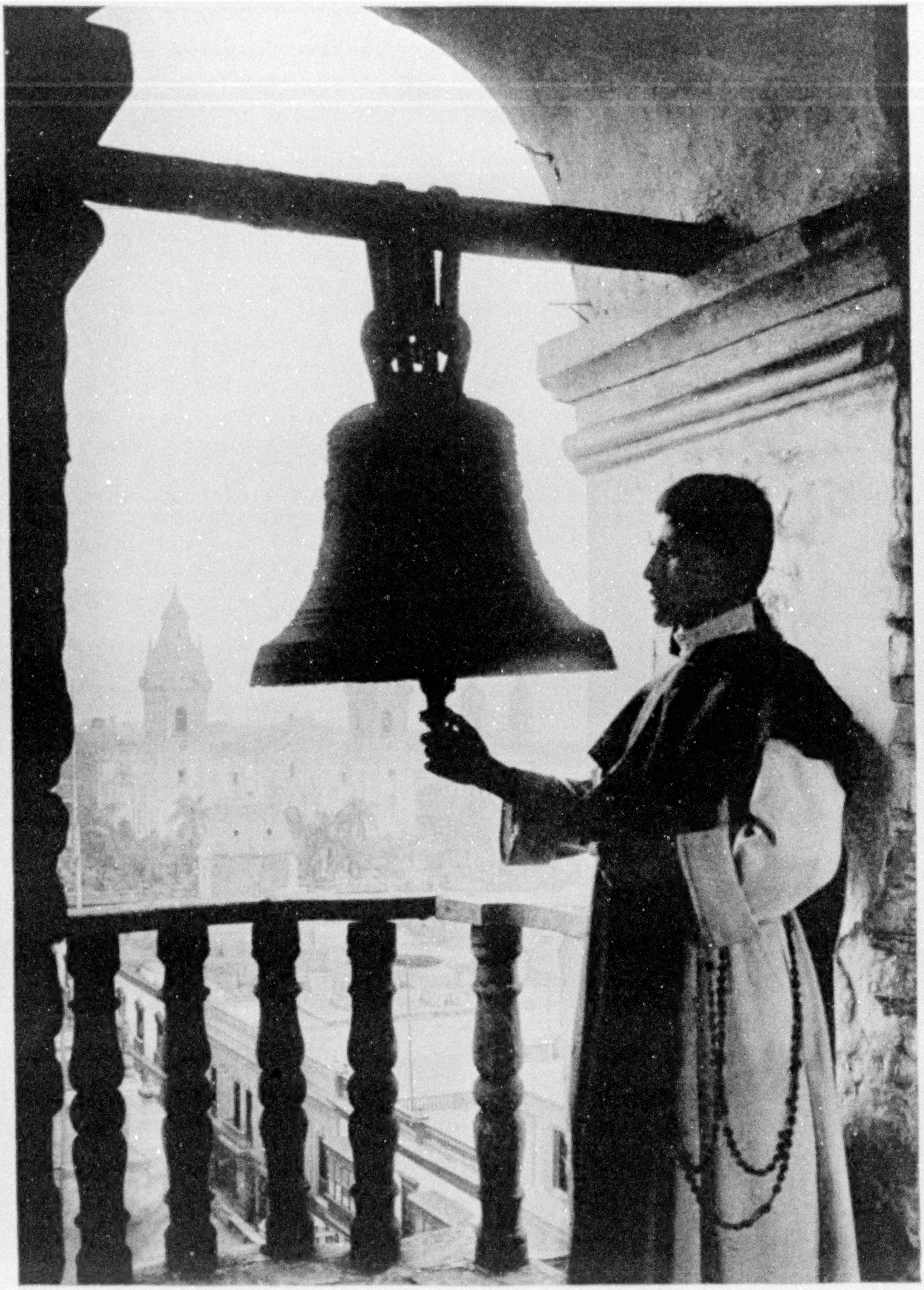
"So I am trying to teach him to want things," explained President Leguia. "When he feels he must have a Yankee alarm-clock and his wife demands a sewing-machine, he will be willing to work regularly. Then we can make some progress."

MAKING BATHS POPULAR

He illustrated his theory by a story. In an up-country mining camp the American managers wished to encourage the employees to bathe. They built a bath-house and equipped it with hot and cold water sprays, but the Indians regarded it as a further evidence of the incurable folly of all foreigners.

Then the Americans announced that those who bathed would be given tickets, and these tickets could be cashed in for five cents each. Soon every Indian was taking his daily bath.

"Now the Americans have reversed the process," said Mr. Leguia with a dry chuckle. "The Indians have formed the habit of taking a daily bath and cannot



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VESPER HOUR IN LIMA

From the bell tower of the Church of San Domingo the priest looks over the lovely city to the twin-towered cathedral in the distance. Pizarro gave to Lima the sobriquet "City of the Kings."

XUM

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THE CATHEDRAL, LIMA, WHERE REST THE BONES OF PIZARRO

The reputed mummified body of the Spanish conqueror of Peru is contained in a glass casket in this handsome building of semi-Moorish architecture. It was Pizarro who founded the cathedral in 1535. Little remains of the original building, however.

XUM

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WHEAT-FIELDS AMONG THE MOUNTAINS OF PERU: THE TERRACES, WHICH ARE STILL CULTIVATED, WERE BUILT BY THE INCAS CENTURIES BEFORE THE ARRIVAL OF COLUMBUS IN THE WESTERN HEMISPHERE (SEE TEXT, PAGE 612)

It was in this country and among these terraces that the potato was born into the vegetable kingdom (see "The Staircase Farms of the Ancients," by O. F. Cook, in THE GEOGRAPHIC for May, 1916).

stop. So they work in order to get the five cents."

It is eight miles from Callao, the seaport, to Lima, the capital of Peru, but the sailors thought nothing of that. They had been provided by the Navy Department with concise little manuals, edited with the coöperation of the National Geographic Society, in which the things worth seeing had been set forth, a plan of the city given, and the monetary system explained. Armed with these, the men went where they pleased.

There were 13,000 men on the vessels of the fleet and most of them had several days' liberty, yet not one unpleasant incident marred the visit. It is true that now and then one met a sailor who was irrepressibly musical, and it is likely that the masters-at-arms had occasion to put a man or two in the "lucky bag" on each ship.

THE CONDUCT OF THE MEN OF THE FLEET INCREDIBLY GOOD

But the conduct of the fleet was incredibly good. Pisco is a white whisky which plays havoc with the unaccustomed, but after one trial the gob let pisco alone.

Every man gazed at Pizarro's bones and most of them had a working version of the Conquistador's life and achievements, and all seemed to know the story of his death.

"He'd a-killed all seven," one heard them say, "only his sword got stuck in the wishbone of one of 'em."

They walked endless miles through Lima's dusty streets and regarded open-eyed the Indian women who jounced in astraddle of little horses with milk-cans slung over the saddle bows, and winked harmlessly at the giggling girls who sheltered themselves behind iron grilles at the second-story windows.

At least every fourth man had a camera and they bought picture postcards tirelessly. All Peruvians smiled at them in a comradely way and the Americans were inspired to try their phrase-book Spanish on their hosts. Often it worked, too.

In every café one saw little parties about the round tables, laboriously working out an *entente cordiale*. Between times they grinned at each other and made motions to the brown boys who served drinks.

THE GREAT EVENT OF THE VISIT—THE BULL FIGHT

So far as the gobs were concerned, however, the great event of the week was the bull-fight. This was given by the Peruvian Government in honor of the American visitors, and Belmonte, who is one of the most celebrated Spanish matadors, played his spectacular part.

It was a superb bull-fight, as bull-fights go. The Lima ring is the largest in the world and the bull has more of a chance than he has elsewhere. The bulls were savage and active, too, so that in the very first fight an important section of Belmonte's skin-tight breeches was torn away and a red line appeared across his white skin.

The sailors gasped. It was more than they had counted on, apparently. Then a horse was gored, and from that moment the sympathy of the sailors was definitely against the men who took part in this abhorrent torture.

"Go it, bull," they cried whenever a bull charged. "Go get him, bull."

A little brown bull was the real hero of the day, in spite of the gold-laced fighters and the splendor of the spectacle and the age-old ceremony with which the game of butchering bulls and torturing horses was carried out.

This animal gave some evidence of a reasoning faculty. He refused to charge the blindfolded horses, although they were wheeled broadside on to him by the red-capped attendants, and the heavily armored picadors yelled at him insultingly. He paid no attention to the red mantles that were flaunted in his face. But when he charged—and he charged freely—he went straight for the man who waved the flag.

In three minutes he had the ring cleared. The expensive matadors were sitting down behind the shelters smoking cigarettes. The men with the banderillas had climbed to the safety of the balconies. The picadors were silent and the poor old horses were asleep with their chins resting on their knees. So the door was opened and the little brown bull went triumphantly out.

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A BIRD'S-EYE VIEW OF LIMA, SHOWING THE GREAT BULL-RING, THE LARGEST IN THE WORLD

In this great arena a special bull-fight was staged for the entertainment of the men of the American Navy (see text, page 619).

"He was a cross-eyed bull," was the explanation that came up to us.

THE TAXI CHAUFFEURS WENT ON A STRIKE

Even the strike of the taxi chauffeurs did not disturb the happiness of the sailors. Ordinarily the chief delight of the seaman ashore is to pack as many exemplars of his profession as possible in some sort of a cab and then go careering. But the pilots of the four-seatos, who had contentedly served the Limans at a rate of one dollar and a half an hour, American money, for any sort of an automobile that would go, took umbrage at the act of the government in advertising in all the papers that the rate was one dollar and a half and no more, and advising the Americans to resist four-seato aggression.

Therefore they went on strike. They were still willing to haul a Peruvian at the old rate, but if they could not gouge the Yankees they would have nothing to do with them. It did not annoy the boys.

"We've seen taxi chauffeurs before," they said.

Hard work began with the departure of the fleet from Callao and the resumption of maneuvers, when the Pacific fleet joined those of the Atlantic squadron in those tragic waters which saw the crushing of Craddock's gallant British squadron by Admiral Von Spee's ships.

But it was not only the constant march and countermarch of the ships that was watched by the admirals of the fleet. The radio was continually crackling with admonitions to the engineer officer of this ship or that.

ENGINEERING WITHOUT SMOKE

First-rate engineering to a landsman means engineering without a breakdown, but on the sea it likewise means engineering without smoke. A plume of black can be seen by an alert enemy a score of miles away.

In the thirty-odd days I spent on board the flagship *Pennsylvania* I did not see enough smut come from her funnels to daub a lady's handkerchief. There were other ships which smudged the skies like so many factories.

Everything else is subordinate to shooting, on board an American battleship, however. No one can know whether our men are actually better marksmen than the gunners of other navies, but they assuredly believe they are.

The gun crews watch and gossip at target practice, and between times practice speed in loading and firing without orders from the officers.

One of the ships of the American battle fleet was once classed as a bad ship because her captain was a notorious sundowner—which may mean that he was tyrannical and unfair and may only mean that he was disliked.

The captain who replaced him established a "meritorious mast," so that men might be called in front of their fellows for praise as well as for blame. Then he began to preach better shooting.

"There isn't a better ship in the fleet," said the man who ought to know. "His men work with the guns all day long."

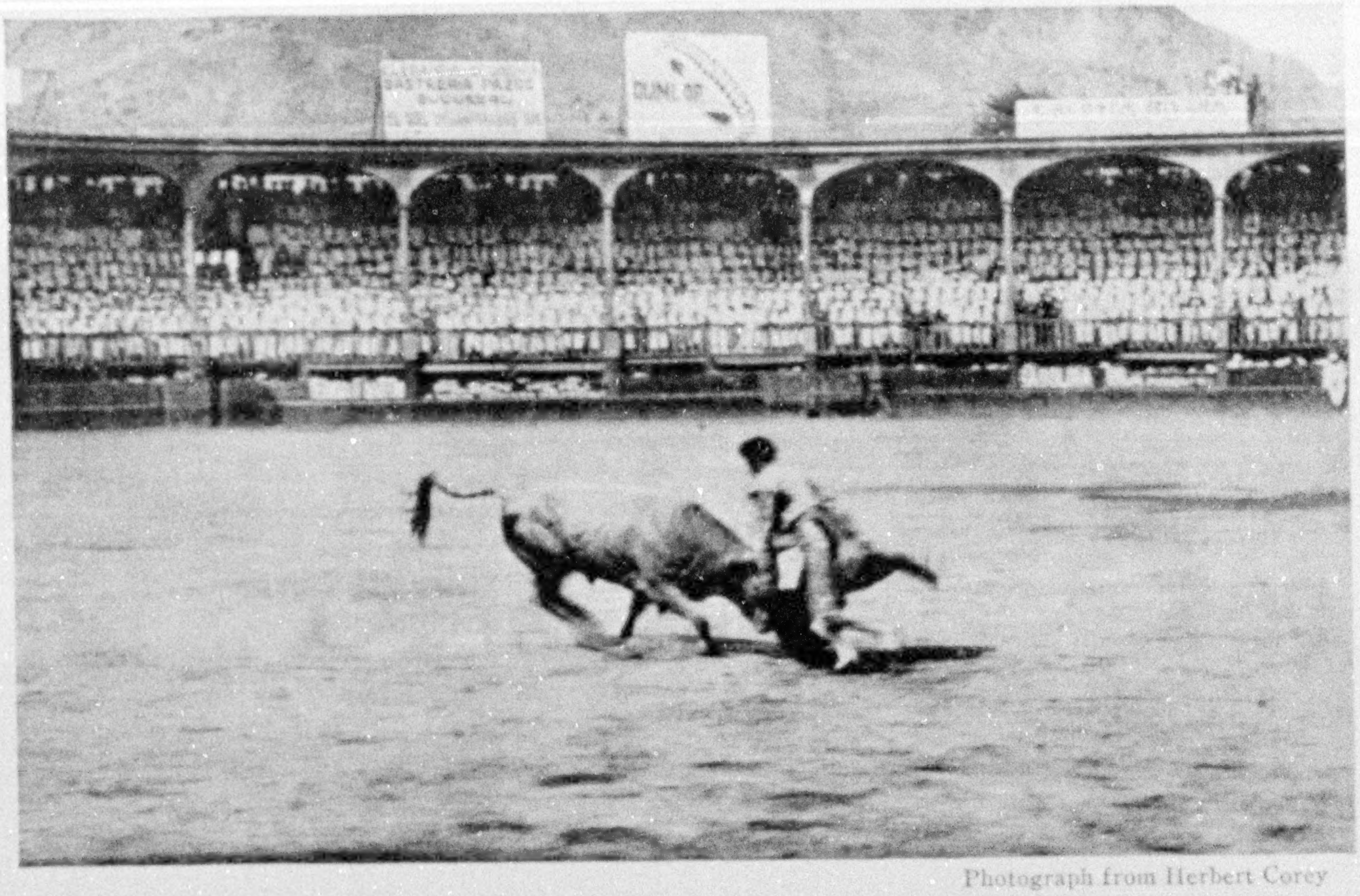
WHERE THE PROBLEM OF AIMING THE BIG GUNS IS WORKED OUT

Therefore I found occasional entertainment in that perspiring center known as the plotting-room. Here young mathematicians juggle with curves and logarithms to discover precisely how to hit the enemy's ship with the first salvo.

If they work out this problem accurately by the aid of adding-machines and established formulas, in the midst of jangling telephones and whistling speaking-tubes, the enemy's ship goes out of action in a beautiful burst of black and red. Otherwise the spotters in the fighting tops and in the ship-planes must take up the work of finding the range.

In getting the range, practically the only factors really considered are the presumed distance between the two ships, the speed at which each is going, the nature of the wind and the density of the atmosphere, and, last of all, the temperature of the powder-magazine. It seems almost too easy.

Upon returning to Panama the fleet paid its visit of ceremony to the ruins of Old Panama, precisely as it had to Pizarro's bones in Lima. The navy's look-see manuals informed the men that Sir Henry Morgan sacked the town in 1671, after struggling through the jungle for days.



Photograph from Herbert Corey

A CRITICAL MOMENT, WHEN THE "CROSS-EYED" BULL CHARGED (SEE TEXT, P. 619)

The members of the Atlantic fleet, for whose edification the spectacle was staged, occupy practically all the seats in that portion of the structure shown in the photograph.

Photograph from Ernest T. Fauroat

THE BULL-FIGHT AT ITS HEIGHT: LIMA, PERU

From the moment the first horse was gored the sympathies of the American guests were with the bull rather than with his human torturers. "Go it, bull!" was the cry which echoed from every tier of seats, as the animal would charge the gold-laced matador and the resplendent picadors.

Official Photograph, U. S. Navy

"MICKY" RECEIVING HIS MORNING BATH

On their way home after their visits to Peru and Chile, the men of the Atlantic and Pacific fleets acquired an amazing assortment of pets and mascots at Panama City. Pigs, ducks, parrakeets, dogs, rabbits, and even a tiger's cub were included in the floating menageries.

XUM

He seems to have been thoroughly modern in his financial theories. After capturing many mule-loads of gold, he had it all loaded on board his own ship. Then he set sail for the nearest port in which a responsible official could be found, bought a pardon and the knighthood which gave him his title, and then blithely set about hunting down his old comrades for the bounty which was then paid for buccaneering scalps.

One visit to Old Panama was enough, however, and once was enough over the rough country road that led to it through fields that gave evidence of the fertility of the Isthmus when the jungle is once cleared away, and between rows of tin-roofed shacks in which brown men and women mixed relentless drinks for all comers.

Some of the sailors carried their antiquarian researches so far as to visit the golden altar which had been taken from Old Panama in time to save it from Sir Henry Morgan's hands.

PETS OF ALL SORTS COLLECTED

Most of the men devoted themselves to the investigation of the town. Many bought the most extraordinary assortment of pets that even a longsuffering American battle fleet ever carried. Pigs and dogs and parrakeets and ducks and rabbits were taken aboard. One man even brought on board the *Pennsylvania* a tiger's cub, the tiger being of the Isthmian variety, of course. Then they were ready for the inter-fleet competition.

One result of the boxing matches was the development of perhaps the first Filipino champion in the person of Javier, a mess attendant, who won the flyweight boxing contest without the slightest difficulty and seemed competent to win a score more in the same ring. The Atlantic fleet won most of the boxing and wrestling and aquatic events, but lost the three baseball matches.

The fact is worthy of note, because it afforded opportunity for one of the finest exhibitions of sportsmanship one could ask to see.

TRUE SPORTSMANSHIP IN THE NAVY

The Atlantic fleet had a band of 195 pieces—the sort of band that made the listeners want to throw their hats and cheer when it played patriotic pieces—and a cheering section under the leadership of a young ensign, who once made New York talk about him instead of the Army and Navy football game, when he led his cheerers there. It also had an immense banner, one hundred odd feet long, with the letters A-T-L-A-N-T-I-C printed on it six feet high.

So the Atlantics were beaten. Through the series the gobs had rooted for their players as best they knew how. They had cheered defiantly and insultingly and they had cheered when cheers were needed to restore morale. Curly had thrown handsprings and turned flipflops and danced with the music. They had clapped their hands—a thousand of them, like this—tatatata, tatatata, tatatata, tata, tata, and they had driven the Pacifics utterly wild by wailing "Margie" at them. No one knows why the Pacifics so hate and utterly detest this harmless song of "Margie"; but they do.

Then the Atlantics were beaten. And that huge band crashed into a chorus that made the cold chills run up and down one's spine and brought the spectators yelling to their feet. The big banner with "Atlantic" on it, supported on boathooks by forty sailors, was paraded about the field, preceded by a cheering section of five hundred men and followed by a solid square of loyal Atlantics. Homage was paid to the victors, and then the Atlantics marched to the box where the admirals sat in state, and cheered while admirals and staffs stood in salute.

It was a fine and sportsmanlike thing to do.

Then the fleets parted for the winter's work with the guns.

Notice of change of address of your GEOGRAPHIC MAGAZINE *should be received in the office of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your August number, the Society should be notified of your new address not later than July first.*

FAMILIAR GRASSES AND THEIR FLOWERS

By E. J. Geske and W. J. Showalter

(With Illustrations in Color from Paintings by E. J. Geske)

THE dynasty of the grass family dates back to the days of the forefathers of the horse, the camel, and many others of the important herbivorous animals of the present day, and there is little doubt that the evolution of many animals into orders and forms of today was greatly facilitated by the advent of the grass family in the vegetable kingdom.

Today, of all the plants that cover our earth, grasses rank second to none in importance. In the matter of utility to man and beast, no plant or group of plants has ever played so great a part in the history of the world, and we may well say with Solon Robinson that "Grass is King."

The 10,000 species of the order, of which 1,300 are indigenous to the United States, are distributed throughout all the zones of the earth, and range in size from a few inches in height to veritable forest trees towering sixty feet and more.

Wherever rainfall sufficient to sustain plant life occurs, and at intervals of time not too distant, and with temperatures above freezing at least part of the year, some members of the family will be found. They readily adapt themselves to soil and conditions and flourish and propagate their kind.

Regions that afford ideal conditions are the great prairies of the United States and Canada, southern Russia, Siberia, the grassy plains of South America, and Africa.

THE BAMBOO IS A GIANT GRASS

Wherever the rainfall is insufficient for forests and the climate is not too arid, grasses prevail over all but the hardiest vegetation. In these areas often more than 90 per cent of the indigenous plant life belongs to the grass order, and, except where cultivation of some species has excluded its rivals, it is not uncommon to find from twenty to sixty distinct species inhabiting almost any locality.

Rice, wheat, corn, oats, barley, and rye are grasses. They enter so largely into the relations of mankind that the country which is best able to supply the world with these necessary articles of food commands the destinies of nations.

Several groups of grasses, like sugarcane, furnish sugar and its by-products. Brooms, paper, rugs, hats, and innumerable articles of commerce are made of grasses, and even houses are built and furnished with their products, not only in darkest Africa, but in many civilized countries.

The giants of the order are the bamboos, the great trunks of which furnish material for an endless number of articles of commercial importance. The pigmies are the various forage grasses, which furnish pasturage for domestic animals and beautify our parks and lawns.

Nor is the story of the merit of the grasses more than half told when it is related that they are "Man's bread and meat; many things good, and most things sweet."

GRASSES GUARD THE SOIL

Grasses are the overseers of the soil. What is more irresponsible than the sands of the seashore and of the desert? Driven hither and thither by every shifting wave and wind, they now drift here and lodge there. Now they bury forests, now they expose the bones of those who lie asleep in God's Acre, while in the waste spaces of earth the sand-storm overwhelms the traveler and his caravan.

If it were not for the grasses, the soil of hillside and plain would be as shifting as the sands of seashore and desert. Every raindrop would be a vehicle on which a grain of the soil would steal a careless ride down to the sea.

But the grasses pin the soil down to its duty. The barren hillside may become a mass of gullies and gulches, but where the grass is master, the soil becomes the faithful servant of man. Even the trees and the shrubs would not possess a sure footing, did not the grasses help hold down the soil around them.

XUM

Though of all plants the most common, the grasses are of all common plants the least known.

The story of the grasses begins long before the age of man. In the geologists' Book of Nature, there are records of grasses that gladdened the face of the earth in the days of the tiny eohippus, from which the horse is sprung.

Some of the grasses have served man so long and in turn have been served by him that they have become as powerless to live without him as he is unable to get along in comfort without them. Imagine corn and wheat fighting their own way through the years. How soon they would fail without a plow and a harrow and a cultivator to prepare their beds and fight their battles with the weeds.

But other grasses have fought for themselves so many generations that they ask naught of any one. These travel along the roadsides of the world, sending their seeds hither and yon, until they have effected a foothold by "peaceful penetration" in a thousand communities.

HOW GRASSES SEND THEIR SEED ABROAD

The bur grass sends its thorny seed burs far and wide, attached to some passing animal or human being. The terrell grass produces seeds encased in cork-like hulls, which float to new fields on the waters of the brook beside which it grows. Couch grass grows from the root as well as from seed, and sends its spear-pointed rootstalks up through many a new foot of soil.

The beach grass has long since learned the tricks of the sand in attempting to bury all that would bind it, and has worked out a plan for circumventing the resourceful wanderer. It rises out of the sand as fast as the dune can build itself up, and at the same time sends its roots downward until it clinches the dune to solid earth.

Many grasses spread like the couch grass, by runners or rootstocks, having a succession of joints, from each of which arises a shoot that shortly takes root on its own account and in its turn sends out other runners.

Others develop only fibrous roots, and usually, like orchard and panic grasses, are found in bunches or tufts.

The seeds of some species are undestroyed and undigested by the animals that feed on them and get their chance to build a new colony through these carriers.

GRASS SEEDS WITH BARBS

Some other kinds of seeds are provided with novel weapons for forcing themselves into the soil. They have a prickly callus which bears stiff hairs growing away from the point like the barbs from the arrow's head. Once the prickly point has penetrated the soil, to draw it out is difficult, since the stiff hairs, rubbed the wrong way, interpose a strenuous objection.

A strong, bent contrivance, known as an awn, and twisted like a rope, is used by some grasses to bury their seeds in the ground. The rope-like twist is influenced by dampness and dryness—it uncoils when damp and coils again when dry. This acts as a motor to drive the seeds into the ground.

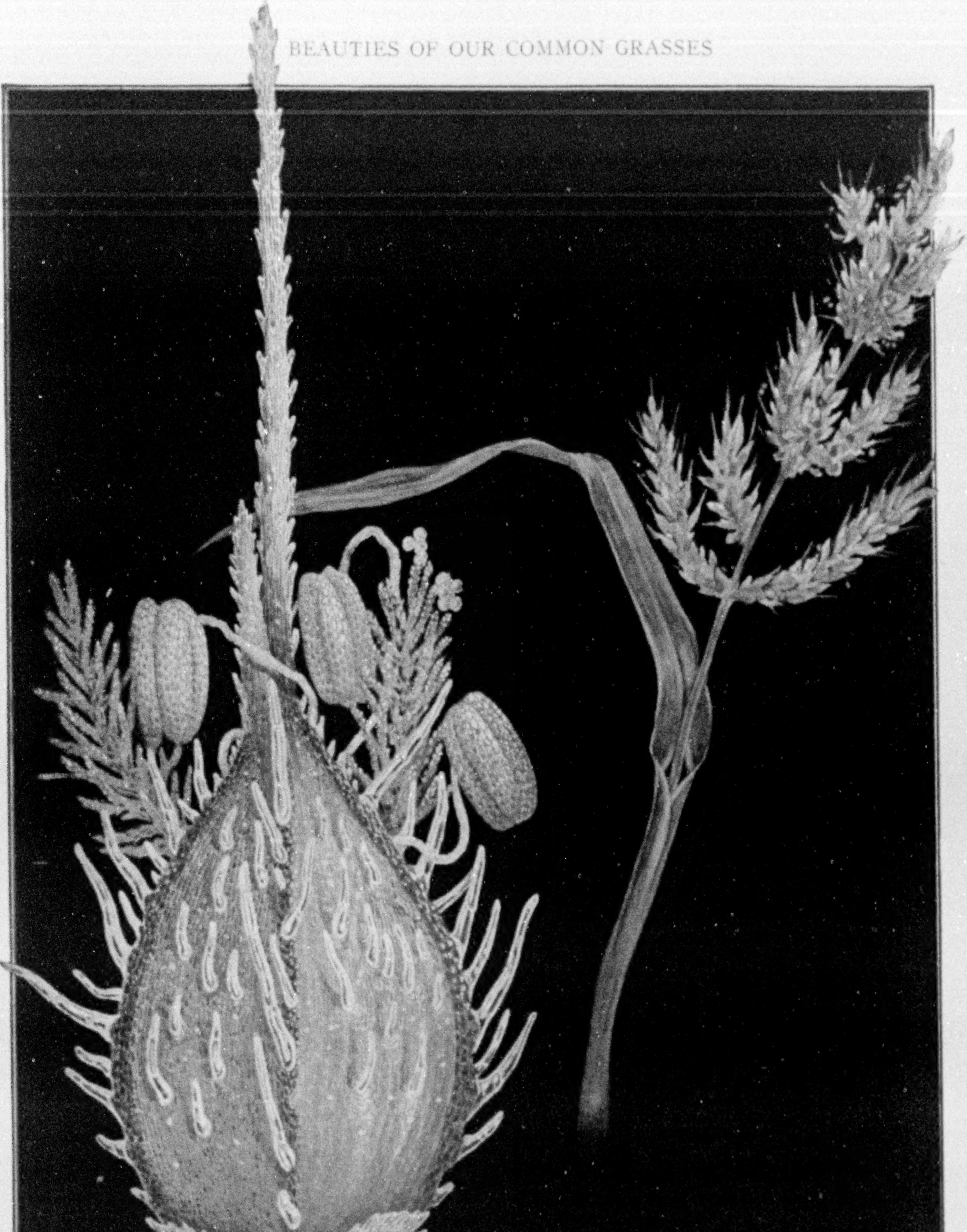
In high latitudes and corresponding altitudes, where the ripening of the seeds is uncertain, entire spikelets are transformed into leafy shoots, provided at the base with rootlets ready to grip the ground and grow wherever they fall.

What wonder that, in view of all these devices, one feels like saying of them as Darwin said of the schemes to which the plants resort in order to insure cross-fertilization: "They transcend in incomparable degree the contrivances and adaptations which the most fertile imagination of the most imaginative man could suggest, with unlimited time at his disposal."

WHY GRASSES HAVE JOINTS

Every one has noted what are popularly known as the "joints" of grass, but which are technically described as "nodes." Their mission is not, as most people believe, to give strength to the stem, but rather to help it always to stand upright.

The cells of these "nodes" are known as "geotropically sensitive"—attracted to the earth or driven from it. A wind comes along and bends the grass, so that it becomes unable to resume its upright position. Thereupon the cells in the "node" on the side of the stem that inclines toward the earth begin to lengthen, thus, by imperceptible degrees, lifting the stem to its upright position again.

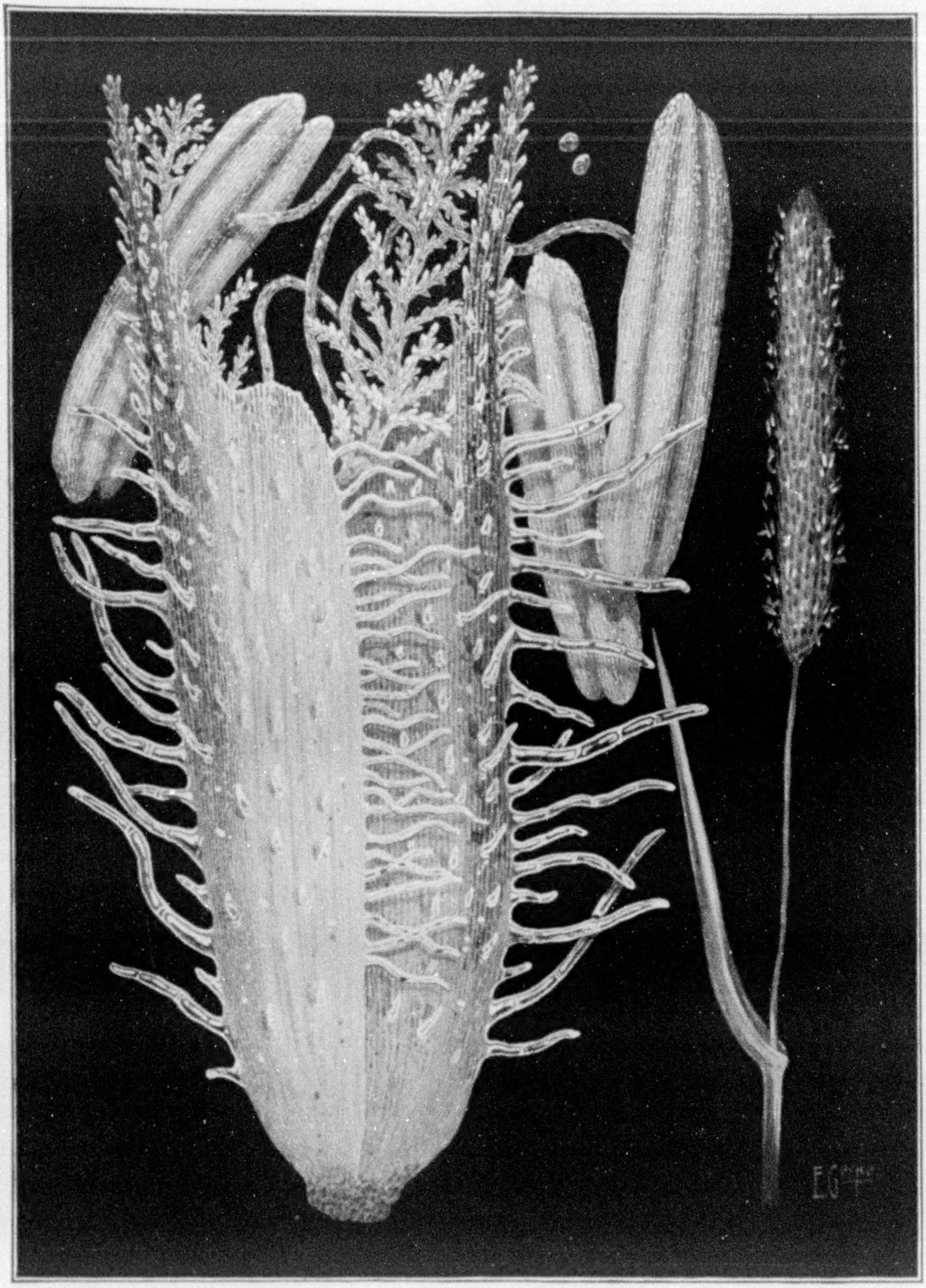


The Illustration Magnifies 30 Diameters

BARNYARD GRASS (*Echinochloa crusgalli*)

The familiar barnyard grass is a strong-growing annual, one to four feet in height, having wide leaves. It grows in moist or well-manured soil. The flowers occur in a compound raceme, or cluster, of spikelets and have long and very rough awns (beards or bristly appendages). The feathery stigmas are crimson and showy. Flowers appear from August to October.

XUM



The Illustration Magnifies 50 Diameters

TIMOTHY (*Phleum pratense*)

Timothy is said to have derived its name from Timothy Hansen, of Maryland, who introduced it into the American Colonies from England in 1720. It is a native of Europe, but is now widely distributed throughout the world. It is the standard hay grass of temperate regions. The flowers are arranged in a dense spike about three or four inches long and containing several hundred flowers.

The Illustration Magnifies 50 Diameters

KENTUCKY BLUEGRASS (*Poa pratensis*)

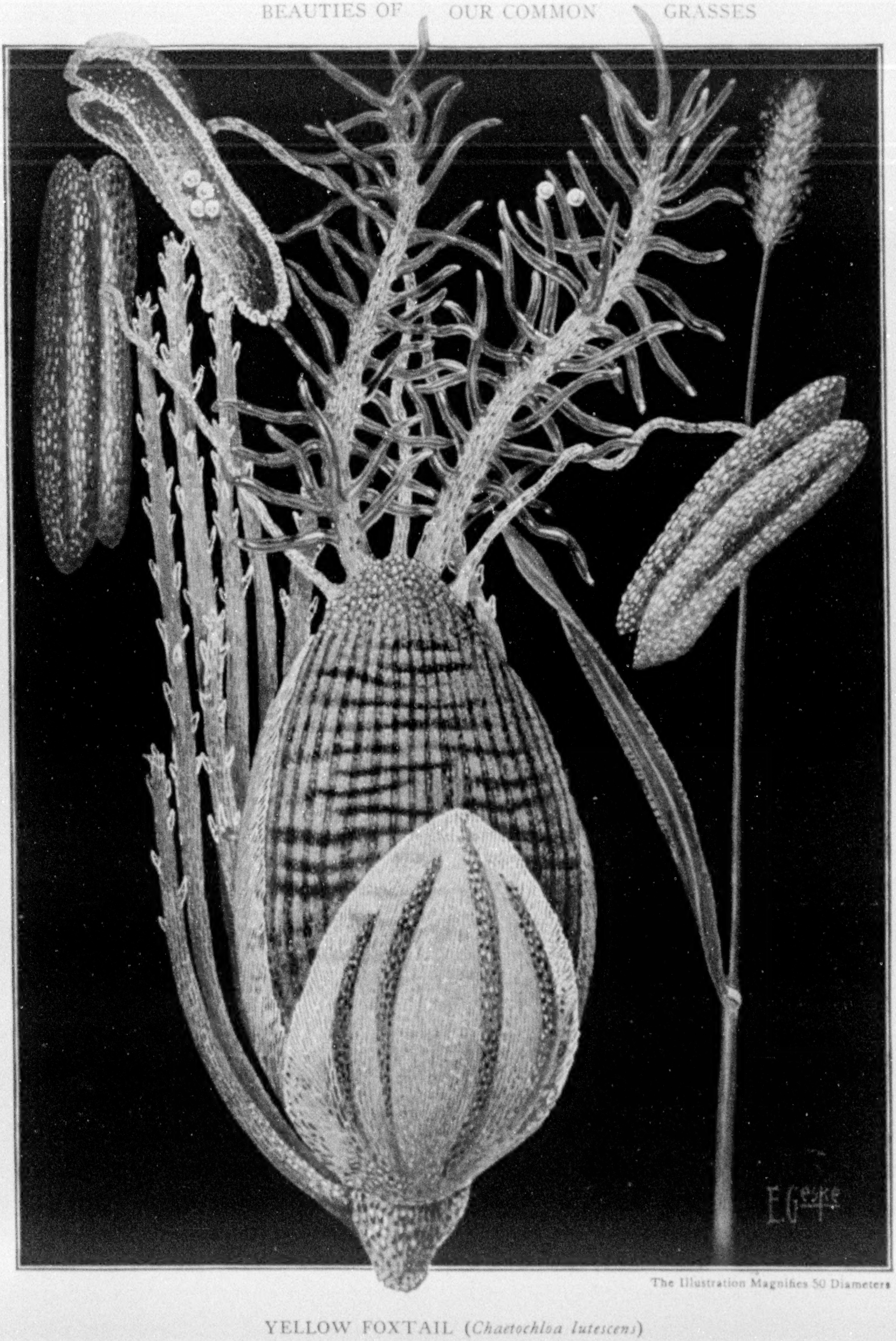
Kentucky bluegrass is a meadow grass of high order and unequaled for pasturage. It is also a favorite lawn grass where the soil is fertile, there is plenty of moisture, and the sun is not too hot. It blooms in May and June and the flowers occur in a loose panicle, or tuft, of spikelets, each spikelet having three to six flowers.

XUM

The Illustration Magnifies 25 Diameters

PURPLE-TOP (*Triodia flava*)

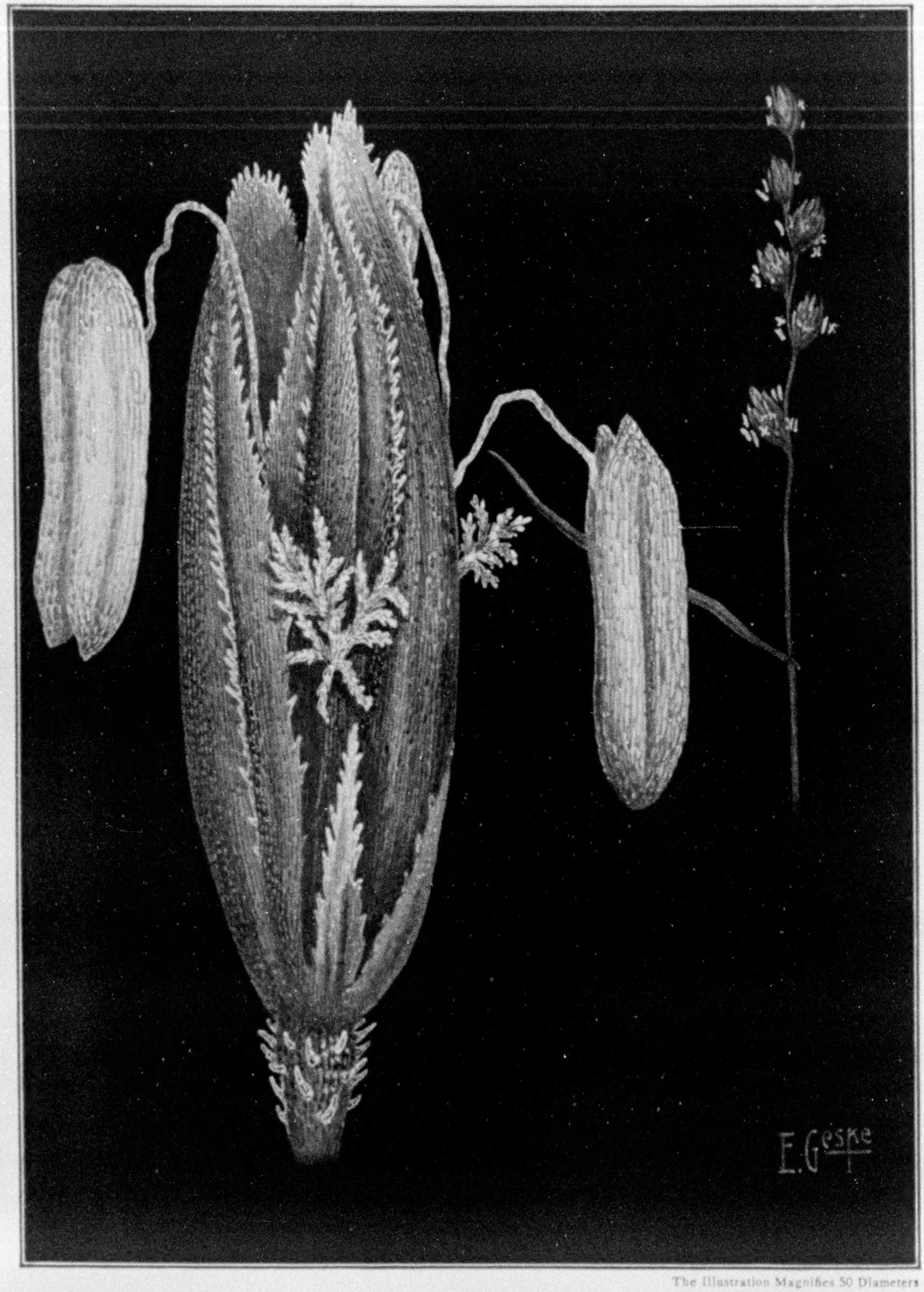
Purple-top is a perennial growing to the height of 3 to 5 feet, with smooth, flat leaves. It is found in dry fields from southern New York, the Ohio Valley and Missouri southward. It is a very showy grass with large panicles of flowers which occur in 5- to 7-flowered spikelets. The glumes, or husks, are deep purple and shining, and the feathery stigmas almost brown, standing out in strong contrast against the bright green of the stem and foliage.



The Illustration Magnifies 50 Diameters

YELLOW FOXTAIL (*Chaetochloa lutescens*)

Yellow foxtail is a smallish plant commonly found in cultivated fields as a weed. The flowers grow in a dense cylindrical spike of a yellowish color. A cluster of bristles accompanies each floret, the coloring of which is delicate and beautiful. The perfect flower is transversely wrinkled, and surmounted by stigmas of a ciliate character (marginally fringed with hairs), beautifully colored. "Pigeon grass" is a name used in England for this plant.



The Illustration Magnifies 50 Diameters

RYE-GRASS (*Lolium perenne*)

Rye-grass is a perennial with flowers occurring 8 to 15 in spikelets situated alternately on the rachis, or axis. It grows in fields and lots and is commonly considered a weed. Its blooming period is in June. Found mostly in the eastern part of the United States, it was introduced from Europe, where it occurs in numerous varieties.

The Illustration Magnifies 54 Diameters

REDTOP (*Agrostis palustris*)

Redtop is a favorite perennial forage grass of the northern States, where it is much cultivated. Its flowers occur in a cone-shaped open panicle. The glumes are green and whitish or oftener with a reddish blush, which has given rise to the name "redtop."

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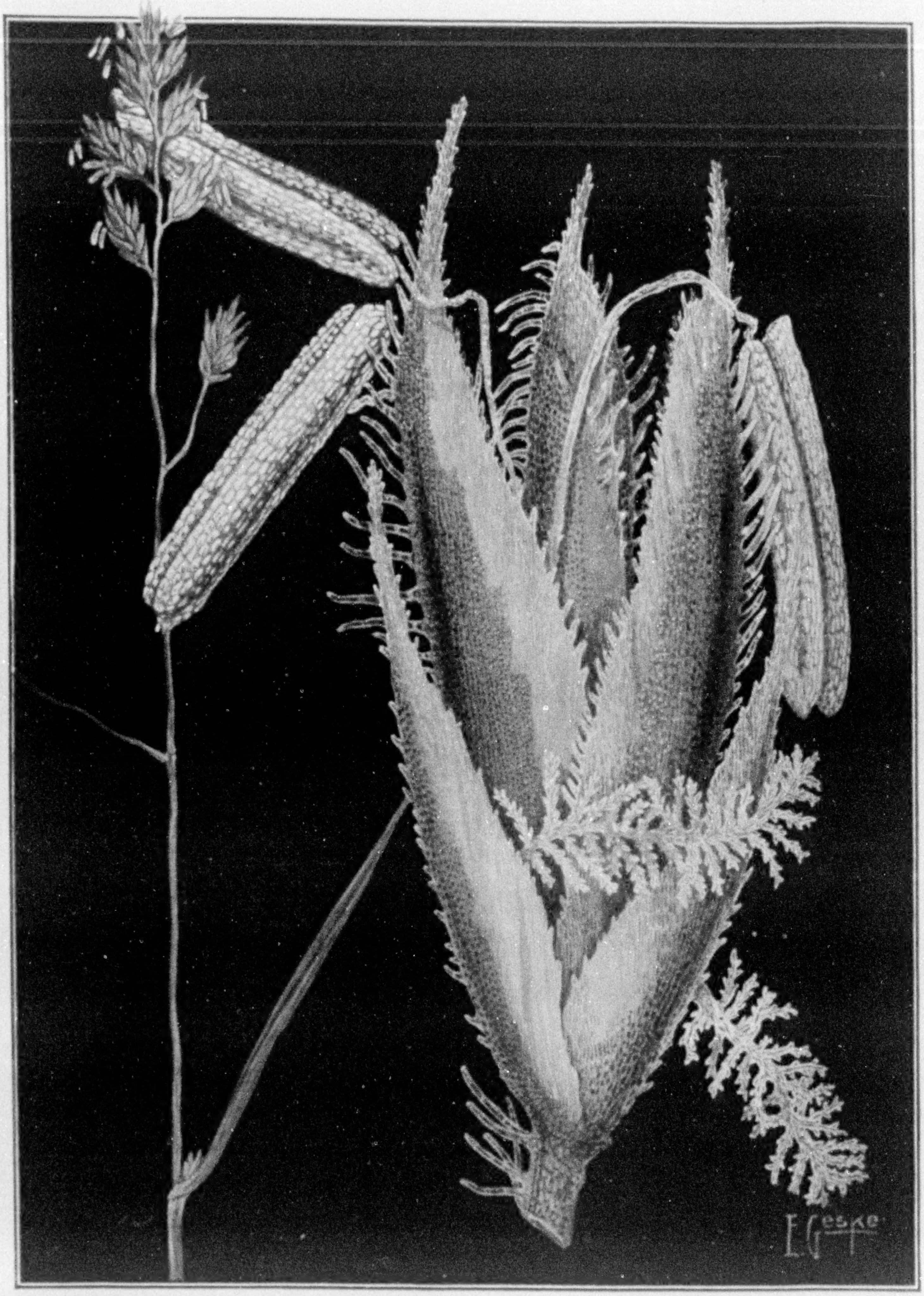

The Illustration Magnifies 25 Diameters

ORCHARD GRASS (*Dactylis glomerata*)

Orchard grass is a stout perennial growing in fields and yards, and attaining a height of three feet. The flowers occur in 3- and 4-flowered spikelets forming a dense, branching panicle. In early spring it affords good pasturage. Flowers appear in June, the flowering stem growing out of a dense tuft of broad leaves.

Nowhere else will one get a more striking picture of why botany seems a hard study to the layman than in the names of the different parts of a stalk of corn. The tassels are the stamens, the ear is a "spike borne in the axils of the leaves," and the grains are "the fertile flowers." The corncob is a "thickened rachis." The chaff covering the cob is "the flowering scale and palet," and the silk forms "the elongated pistils of the flower."

One of the most interesting of all the wars that Nature stages is the struggle between the grasses and the trees. Go where the forest and the prairie meet and watch the efforts of the timber to drive wedges into the grasses' lines; and observe the counter-offensives of the grasses in gaining footholds on the treeward side of the No Man's Land of the battle zone.

Strategy and tactics alike enter into the struggle. There is nothing of the barbarity of the frost and forest struggle, for neither attempts to dislodge the other; each seeks only to outlast the other and to prevent the other from bringing in reinforcements.

UNDER THE EYE OF THE MICROSCOPE

Under the eye of the microscope one may see something of the true glory of the unpretentious grasses, and in the accompanying color series the power of our eyes has been multiplied so that we may discern something of the beauty that lies hidden so deep that the cursory glance is not privileged to behold.

We are told a great deal about the beautiful green of lawn and meadow, but little is known by the layman of the gorgeous and often grotesque flowers, for they can only be seen to advantage under the microscope.

The flowers of most of the smaller grasses are perfect, and their component parts are readily comparable to the larger and better-known flowers.

In grass flowers the petals and sepals are replaced by glumes; there are usually three anthers and an ovary or pistil surmounted by one or two stigmas, these latter often branched and feathery in form.

When seen under the microscope at moderate enlargement and with reflected lighting, the color effect and structure suggest a delicate piece of beaded work profusely jeweled and built into fantastic forms and designs.

From their extreme delicacy it follows that the superficial parts of the flowers are semi-transparent, the colors being iridescent or those of one part glowing faintly through the translucent cell walls of the overlying parts. Words are inadequate to do justice to their beauty.

In the smallest enlargements of the accompanying color series of illustrations, one square inch becomes slightly more than four and one-half square feet; in the largest, we are able to look at the grasses under a magnification which is equal to stretching a square inch into twenty and one-quarter square feet, or to expanding one square yard into something more than half an acre.

If one could see familiar objects on a like scale of magnification, a normal man would be half as high as the Washington Monument and a mouse would become almost as big as a horse.

BARNYARD GRASS (Echinochloa crus-galli) [Plate I]

The familiar barnyard grass sometimes known as cockspur grass is a strong annual, growing from one to four feet tall, possessing wide leaves, and having an affinity for moist, rich soil. The flowers appear from August to October. The plant flourishes throughout North America except in the extreme north.

TIMOTHY (Phleum pratense) [Plate II]

There is no grass of the field more familiar than the timothy, with its tall, bright green stalk, its succulent blades, and its cattail head. It is the most prized among the haying crops, bringing a higher price per ton than any of the other grasses. In good land, timothy often grows to a height of five and six feet and its heads attain a length of from six to ten inches. The average timothy head is, perhaps, four inches and contains several hundred tiny flowers. The pollen, dashed with lavender, disperses with the slightest touch and is borne on the wings of the wind on its mission of fertilization.

Timothy is a provident grass. During the days of abundant moisture in the ground it stores up nutriment in bulbous thickenings at the base of the stems, which enables it to survive periods of drought better than the majority of its companions of the field.

Timothy seed is one of the lightest of the grass family, and many a farmer allows acres to pass the haying time in order that the seeds may develop. Usually the timothy harvest comes after wheat and rye are in the barn.

It is believed that timothy gets its name from a Maryland planter by the name of Hansen—Timothy Hansen—who is supposed to have imported the grass from England in 1720.

KENTUCKY BLUEGRASS (Poa pratensis) [Plate III]

Though attaining its most luxuriant growth in the far-famed bluegrass region of Kentucky, whose limestone soils also produce Burley tobacco, fat cattle, and fleet-footed thoroughbreds, Kentucky bluegrass is by no means limited in its habitat to the State that was once the "Dark and Bloody Ground." Indeed, it is one of the most common of American grasses and claims for its domain almost every limestone area from the Atlantic to the Pacific.

The habit of the bluegrass in spreading by sending up a running rootstock renders it an ideal lawn grass, since it so readily forms a fine turf. It blossoms in June, ahead of the summer grasses, the flowers occurring in a loose panicle of spikelets, each spikelet possessing three or four flowers. In dry or sandy soil the grass is unprosperous-looking and harsh, but where the limestone pasture-land has sufficient moisture it grows from two to four feet tall and makes that happy time which is known as "knee-deep in June."

PURPLE-TOP (Triodia flava) [Plate IV]

Purple-top is a perennial, growing from three to five feet in height, with smooth flat leaves. It is found in dry fields from southern New York and Missouri southward. It blooms in August and September, along with the purple eragrostis, and towers above its associates, the busy panic grasses and the slender paspalums. It comes at a time when it can share the sunshine with the pennyroyal and the other mints which are so often found in its neighborhood. The flowering head of the purple-top is somewhat sticky to the touch.

YELLOW FOXTAIL (Chaetochloa lutescens) [Plate V]

Belonging to the foxtail group, which includes the millets, this grass is widely distributed. It is very attractive when studied carefully, for the dense, yellowish cylindrical spike is full of florets, each accompanied by a cluster of bristles the coloring of which is delicate and beautiful. The perfect flower is transversely wrinkled and surmounted by beautifully colored stigmas.

The millets, cousins of the yellow foxtail, were among the most ancient of cultivated grains. Even the lake dwellings of the Stone Age reveal such quantities of these grains as to lead to the conclusion that they must have yielded the principal bread supply of prehistoric men.

RYE-GRASS (Lolium perenne) [Plate VI]

Rye-grass is a perennial, growing in fields and lots, and is commonly considered a weed. Its blooming period is in June. Rye-grass is found mostly in the eastern part of the United States and is probably an emigrant from Europe, where it occurs in numerous varieties.

Rye-grass has the reputation of being probably the first of the grasses cultivated as a forage plant, and since the days of Charles II has been held in high esteem in England. In America other grasses have answered so well the needs of the farmers that the rye-grass does not figure in his cropping system.

A cousin of Lolium perenne—Lolium temulentum—is supposed by some to have been the tares among the wheat mentioned in the Gospel according to St. Matthew.

In Scotland the seeds of the Lolium temulentum, commonly called darnel, bear the name of "sleepies," on account of what was supposed to be the narcotic effect of its seeds. Scientific investigation has revealed the fact, however, that this effect is produced only by those grains which have become diseased through the attack of a fungus.

REDTOP (Agrostis palustris) [Plate VII]

There are few more interesting grasses than the redtop. It belongs to the bent grasses, which are a group made up of hundreds of species scattered throughout the temperate zones. They monopolize the field and wayside in midsummer as thoroughly as the goldenrod rules the landscape of autumn.

The redtop clothes the land in iridescent tones of reddish purple. One variety used to be known as "bonnet grass" and is found extensively along the reaches of the Connecticut River. It derived its name from the thrifty habits of the New Englanders of yesteryear, who braided the stems into hats.

The flowers of the redtop occur in cone-shaped panicles, while the glumes are green and whitish with a reddish blush reaching its deepest note in the redtop. The illustration shows an albino form of this species.

ORCHARD GRASS (Dactylis glomerata) [Plate VIII]

One of the earliest of the grasses that gladden the springtime is the orchard grass. The English call it cocksfoot grass because of a fancied resemblance of the branching panicle to the rooster's foot.

This plant is a living example that even among the grasses the prophet usually receives his first recognition abroad; for, although it was brought from England to America, it was never appreciated in the mother country until it acquired its abode here.

The orchard grass spreads its flowering panicles to the winds in the days when the odor of new-blown clover sweeps through the land, and with its anthers ranging from purple and yellow to terra-cotta and pink, depending upon the quality of the soil and the quantity of light, it is no mean rival of the clover for recognition.

This species ranks high as a farm grass, since it offers the husbandman pasture for his herds in the springtime and is one of the last to retire before the cavalry of Jack Frost, which precedes the infantry and artillery of Winter.

The flowers of orchard grass are in their glory in June, the stem growing out of a dense tuft of broad leaves.

A NEW NATIONAL GEOGRAPHIC SOCIETY EXPEDITION

Ruins of Chaco Canyon, New Mexico, Nature-Made Treasure-Chest of Aboriginal American History, to be Excavated and Studied; Work Begins This Month

(With illustrations from photographs by Charles Martin, of the National Geographic Society Reconnaissance Party of 1920)

THE National Geographic Society announces the sending out this summer of an expedition to undertake extensive excavations and studies in the Chaco Canyon of northwestern New Mexico. This expedition hopes to discover the historic secrets of a region which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings whose ruins are ranked second to none of ancient times in point of architecture, and whose customs, ceremonies, and name have been engulfed in an oblivion more complete than any other people who left traces comparable to theirs.

Through the findings of this expedition, which begins its work this month (June), the National Geographic Society expects to reveal to its members a shrine of hidden history of their own country.

Both in scientific value of its findings and by adding a new chapter to the progress story of the human race, this project promises to rival such expeditions of The Society as that which dug out the marvelous city of the Andean ancients, Machu Picchu, or that which added to North America's known spots of majesty and seeming magic, the now famous Valley of Ten Thousand Smokes, in the vicinity of Titan Katmai.

A POPULOUS ISLAND IN SEA OF SAND

Chaco Canyon is that segment of the Chaco River which is cut out near the borderland of San Juan and McKinley counties, New Mexico. Its sheer, but sometimes crumbling, walls of sandstone rise from its floor anywhere from 100 feet to a height nearly equal to the United States Capitol dome. From their upper ledge stretch semi-desert wastes, making for an isolation which adds another mystery to the bygone metropolis of the canyon's maw: Whence came the lumber to build and whence the water to cultivate the corn, beans, and squash of these aboriginal farms?

To answer questions like these, the expedition not only will include archeologists, who will study periods of habitation and the origin of the tribes, but also will have agriculturists and geologists, who hope to patch from a crazy-quilt of half-submerged ruins a complete picture of the lives, customs, and culture of these early Americans.

A GIANT CANAL CARVED BY NATURE

From an airplane this gash in the desert surface might resemble a magnified sector of the Panama Canal. Closer inspection would disclose, however, not an expanse of water, but an unwatered canyon, in or bordering which are a dozen huge ruins that look to the casual observer like remains of giant apartment-houses, containing hundreds of rooms, with associated temples or sanctuaries, known as kivas, and lesser dwellings, the true significance of which is not yet known.

More astounding still, some of these larger structures, such as the Pueblo del Arroyo (arroyo—wash), one of the two ruins upon which The Society's expedition is to concentrate its investigations, are built after the familiar E-shaped ground plan of the modern office building,

PUEBLO BONITO FROM THE NORTHEAST: CHACO CANYON

NORTH WALL OF THE PUEBLO BONITO AS SEEN FROM THE NORTH: CHACO CANYON

Large beams have been torn from the round holes at the top. Today no timber of this size is to be found within forty miles of the canyon. The openings at the ground level have been cut by vandals.

HOPI GIRL OF WALPI (PLACE OF THE NOTCH)

A HOPI "UNIVERSITY" AT WALPI

Garfield's ideal of Mark Hopkins on one end of a log with himself on the other was anticipated by the American Indian, whose tribal leaders are teachers in such primitive but effective agricultural "universities" as this scene discloses.

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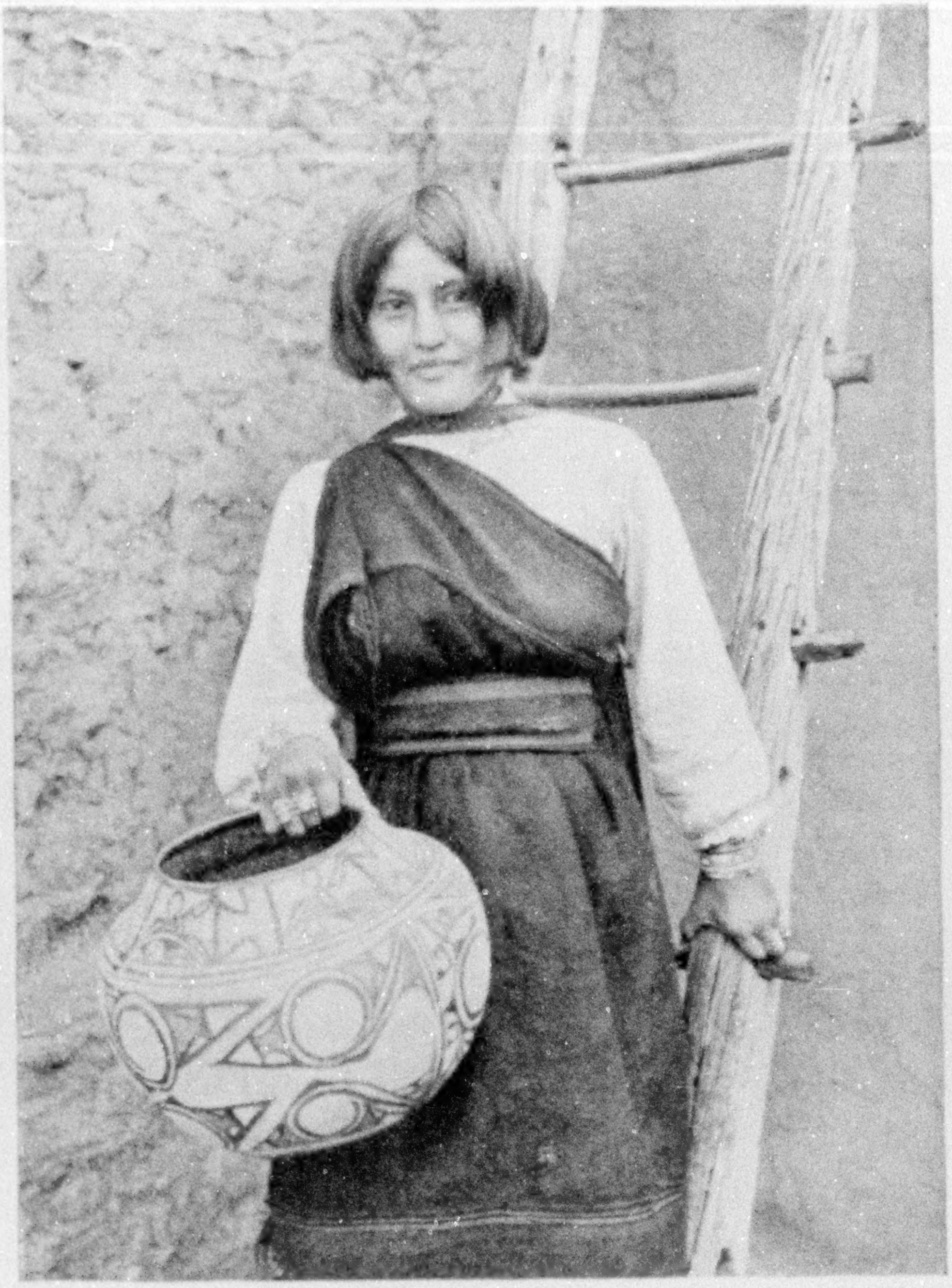


TWO BEAUTIES OF THE ZUÑI

The Zuñi women are attractive Indian types when young; the Zuñi pottery still is made according to aboriginal methods and patterns. The latter is as distinctive for its coloring as is the exquisite ware of the Chaco Canyon for its black and white design.

with the addition of a curved wall binding the ends of the E projections and forming inner courts. The other ruin to be studied, Pueblo Bonito (bonito—beautiful), is a D-shaped building, with its curved wall 800 feet long.

Archeologically this ancient Island of Manhattan, surrounded by a sea of sand, may accurately be described as "a hundred miles from anywhere"; for it is 100 miles north to the cliff dwellings of the Mesa Verde, 100 miles south to the ancient Zuñi towns, and 100 miles west to the ancestral site of the Hopis.

A reconnaissance party dispatched last summer made a report which, when examined by The Society's research committee, bristled with such interesting scientific problems that authorization and appropriation were made for the expedition which begins its work this summer, under the leadership of Neil M. Judd, curator, American Archeology, U. S. National Museum.

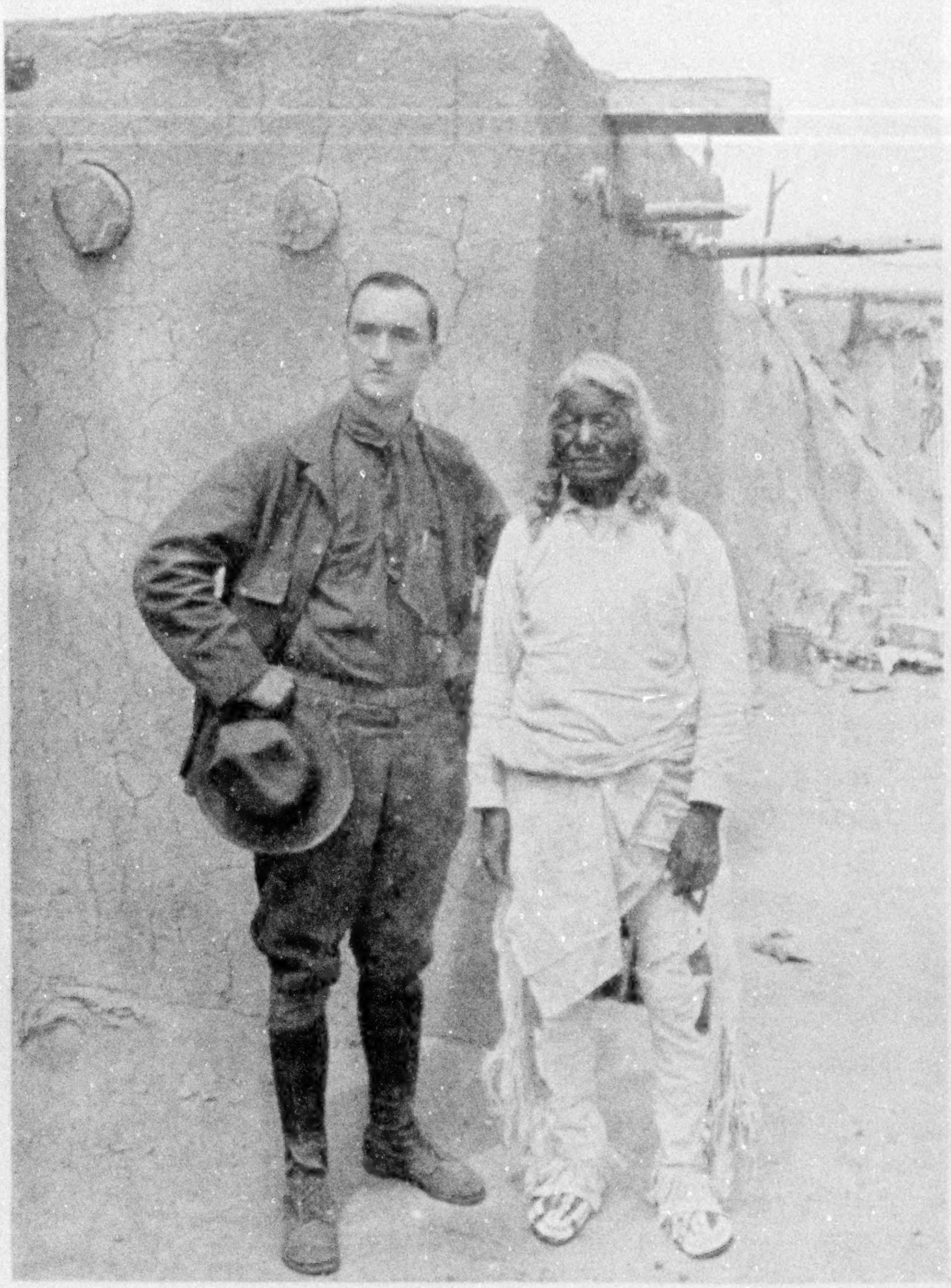
Within an area less than half that of the District of Columbia there are eighteen enormous community houses having from 100 to 800 or more rooms. There also are other structure types, such as the three- to twelve-room dwellings, groups of "talus pueblos" under the wall of the canyon, in the immediate vicinity of the large buildings, and tiny cliff houses and storage cists under the canyon wall itself.

Then there are circular structures, adjacent to both large and small dwellings, and a semi-subterranean home built of mud instead of stone—the last mentioned found by The Geographic's reconnaissance party—which points to possibility of other ruins of greater antiquity that will be invaluable in tracing the development of this aboriginal civilization. The existence of these last mentioned in the Chaco Canyon region had not previously been suspected.

If the major groups were inhabited simultaneously, it is estimated the canyon population could not have been less than 10,000. This Indian city lay in a region so unfriendly that even the nomadic Navajo has not attempted to

cultivate it. Hence the question, What has happened there? Did the climate change? Were the surrounding arid wastes once fields of cotton, corn, squash, and beans? Or did these aborigines of northwestern New Mexico have an irrigation system akin to that of the Ifugaos of the Philippines or the rice terraces of China?

Was the American Indian independent of any Nile, toward whose delta such an ingenious people as the Egyptians tended; and did he build apartments no less colossal and of more immediate service than the Egyptian "race of undertakers" constructed for their dead?



NEIL M. JUDD, LEADER OF THE NATIONAL GEOGRAPHIC SOCIETY EXPEDITION, AND SANTIAGO NARANJO, GOVERNOR OF A SANTA CLARA PUEBLO

Having been a member of numerous expeditions sent to study the natural wonders of the Southwest, Mr. Judd is admirably equipped by experience to undertake the work entrusted to him by the National Geographic Society. He was one of the members of the Utah Expedition, which, with a surveying party of the General Land Office, in 1909 discovered the Nonnezoshi, greatest of nature's stone bridges (see "The Great Natural Bridges of Utah," in The Geographic for February, 1910).

One fact is fairly certain, that this people of a period variously placed between the time of Julius Cæsar and William the Conqueror had a democratic form of government and elected a governor every year.

To the explorer, the Sherlock Holmes of ancient annals, equipped with pick and shovel, even a cursory inspection reveals clues that point to the recovery of buried treasure of history. For example, attention was attracted by masonry reinforced by timbers beneath the precipitous rocks that frown over the Pueblo Bonito. This represents a naïve effort to support a huge mass of solid rock weighing thousands of tons which threatened to topple on the great building beneath. This child-like engineering experiment was surprising, in view of the architectural skill disclosed in the construction of buildings which are superior in masonry to any other aboriginal structures in the United States.

The Society's reconnaissance party examined and reported upon the availability of 16 of the canyon's 18 major ruins. The Pueblo Bonito and the Pueblo del Arroyo were selected as promising the richest rewards. These two ruins lie in the very heart of the Chaco Canyon National Monument.

Pueblo Bonito has been called the fore-

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PUEBLO BONITO AS SEEN FROM THE CLIFF OF CHACO CANYON, LOOKING TOWARD THE SOUTHEAST

Excavation will outline the structure more clearly and uncover, in addition, the rare treasures of exquisite jet and turquoise ornaments, utensils, and tools of the 1,000 or more aboriginal tenants of this mammoth D-shaped apartment-house, which had an acreage and height comparable to the United States Capitol, disregarding its dome.

most prehistoric ruin in the United States. It is the largest of the ruins, the most complex in design, the most impressive. It seems to tell most clearly the unwritten story of the forgotten people who once dwelt within its silent walls. It covers an area approximately that of the United States Capitol. Its 800 rooms probably sheltered from 1,000 to 1,200 souls.

These mysterious tenants tilled the soil of the broad, level canyon floor; they hunted deer and antelope on the mesas overlooking the valley; they probably waged war on the Navajo, the Philistines who pressed upon them from the north.

RUINS ARE DEPOSIT VAULTS OF CERAMIC TREASURES

Already ceramic remains of rare artistry have been taken from Pueblo Bonito, exquisite ornaments of jet and turquoise mosaic, tools and utensils of bone, stone, and wood. Tons of earth and stone have been removed in search of material. Yet the great ruin still guards priceless secrets. The architecture remains to be studied and further evidence of the pursuits of its people needs to be found and interpreted.

Less than a city block west of Pueblo Bonito is Pueblo del Arroyo, occupying a perilous position, as indicated by its name; for the wash, or arroyo, which passes the structure threatens to cut away the bank upon which the ruin is situated. The pueblo virtually is virgin soil for the investigator. It probably stood four stories high. The upper story is gone, the first is buried, leaving only the second and third exposed.

It possesses characteristics that make all the ruins noteworthy and one, in addition, of paramount importance. Beneath the pueblo, exposed only by the caving of the arroyo bank, is a dwelling of the "small-house" type noted above. It is considered that two periods of occupancy at one site, each with its distinctive remains, offers an unparalleled opportunity for study of culture sequence. So far as is known, this is the only instance in Chaco Canyon where such superposition occurs. The fortunate proximity of Pueblo del Arroyo and Pueblo Bonito affords one advantage to the expedition in a region where many handicaps must be overcome.

Geographically the Chaco Canyon ruins have a special interest. They denote admirably the exceptional characteristics that result from an exceptional environment. Being a people hemmed in by natural barriers, their area of activity was restricted.

They were able to meet their material needs by expending only a fraction of their energy. Hence the surplus found expression in religious ritual, attested by the great ceremonial chambers; in architectural monuments, as did that of the European cathedral builders of the Middle Ages; and in ceramics, which flourished there as never before or since, for the black and white ware of the Chaco Canyon has been cited as marking the high point of this art in the Southwest.

The Chaco Canyon is a desert today, unwatered except by floods in the rainy season. The geologist must be relied upon to describe conditions of water supply and crops when the great houses were occupied. Specialists in desert flora must coöperate with the geologists in an effort to picture the economic life of these ancients. Only by the combined findings of these various experts can it be determined whether the inhabitants left because natural changes threatened their food supply, or whether falling cliff masses impressed their superstitious minds as being omens of evil.

Being within the Chaco Canyon National Monument, the Pueblo Bonito and Pueblo del Arroyo ruins are reserved and protected for the American people. The National Geographic Society's investigations, made possible under a permit granted by the Secretary of the Interior, therefore constitute a gift to the public.

The excavations, at the expense of The Society, should solve many of the problems now apparent. Repairs will prevent rapid disintegration of the walls and insure longer life to the ruins.

Photograph by Kolb Brothers

BLASTING ROCK TO MAKE PLACE FOR THE FOUNDATION OF THE GRAND CANYON SUSPENSION BRIDGE

The completed canyon bridge will be 420 feet along the roadway and is suspended 60 feet above the river in normal flow, but only 13 feet above the rushing torrent when it is at its greatest flood. This is the only bridge across the Colorado above Needles, California, which is 360 miles by river course to the south.

THE GRAND CANYON BRIDGE

By Harriet Chalmers Adams

THE suspension bridge over the Colorado River in the Grand Canyon is practically completed. Late this summer it will be possible to ride from El Tovar, on the south rim of the stupendous chasm, to the Kaibab plateau, on the north rim.

The bridging of the Granite Gorge of the Colorado opens up a new wonderland in the Grand Canyon National Park. From the Kaibab plateau, which averages 1,000 feet above the better-known south rim of the canyon, new and amazing panoramas are presented.

Last month I rode down to the river over a trail not yet opened to tourists, messed with the bridge crew, and spent the night in the gorge. The bridge is 11 miles by trail from El Tovar and 4,700 feet below Yaki Point, on the Coconino plateau. The saddle trail, following the Bright Angel and Tonto trails to the river, and up Bright Angel Canyon to the Kaibab forest, is about 31 miles in length. Rim-to-rim travelers will spend the night in a camp near Ribbon Falls, about eight miles beyond the river.

It was a chilly morning when we started for the bridge camp. The wind surged through the pines and pinyons, and twisted the gnarled cypress trees overlooking the chasm. It is the Rim of the Eternal, to be approached with awe; but people differ.

I heard a stout woman, standing by the lookout, say to her daughter, "Oh! Clara, I'm terribly disappointed. We've come at a time of year when there's no water in the canyon!"

A tall man, with a red face, was explaining to a thin man in a plaid suit that, in contour, the canyon was exactly like the doughnuts his mother used to make.

SPRINGTIME ON THE TRAIL

Once down the trail it was springtime. Shimmering blue-jays chattered among the Douglas firs and emigrant butterflies zigzagged by. High in the cliff a canyon-wren piped up a love ditty.

The "expedition" consisted of the Chief Ranger of the Grand Canyon National Park, the wandering lady he escorted, and our two mules. The ranger, whose first love was the Yellowstone, has been many years in the park service and regards our national playgrounds with reverence. He is of the opinion that all those caught carving their names on rocks or trees should be lined up and shot at sunrise.

Down we dropped to the Tonto plateau, the green shelf on the canyon wall lying between the ruby-stained limestone and the gray Archean granite. Here winds a trail of romance.

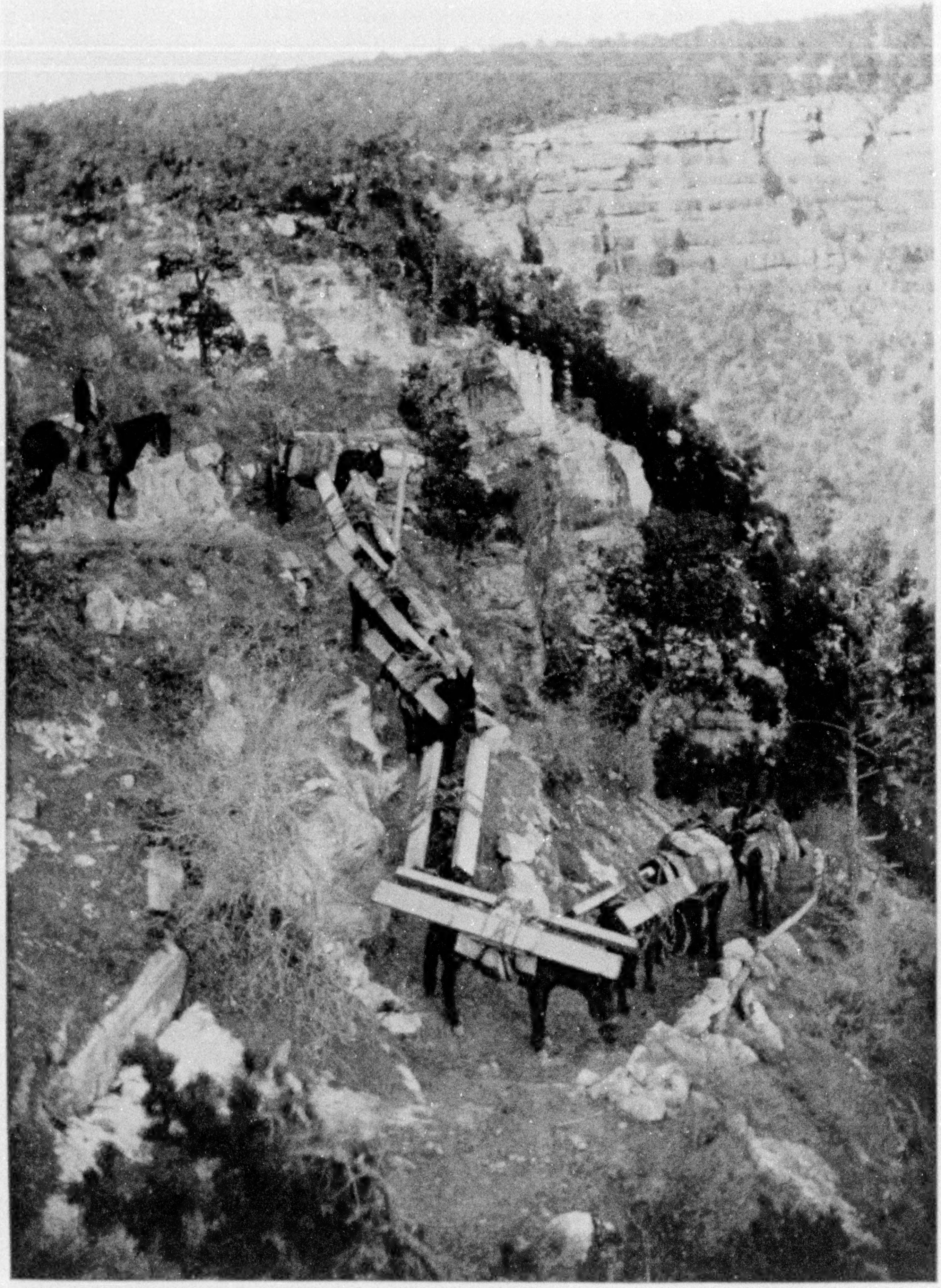
ONCE THE HIGHWAY OF THE CLIFF-DWELLERS

In the shadowy past this was the highway of the Cliff-dwellers. Here, in later years, Spaniards whose names are not written on the historic page adventured. There came occasional fur trappers from lands far to the north; the first of those great explorers who dared the descent of the river; hardy miners, whose half-hearted workings still border the Tonto trail.

We counted seven wild burros descended from pack animals abandoned by the miners. Deer were recently seen in this part of the canyon. Mountain-sheep hide on ledges high up the wall. Many other wild creatures still find refuge in this vast wilderness.

The only animals that we saw, besides the burros, were woodrats nearly as large as squirrels. These "trade rats" accumulate great mounds of rubbish. From a camp they walk off with the soap and the spoons, leaving pebbles and sticks in exchange.

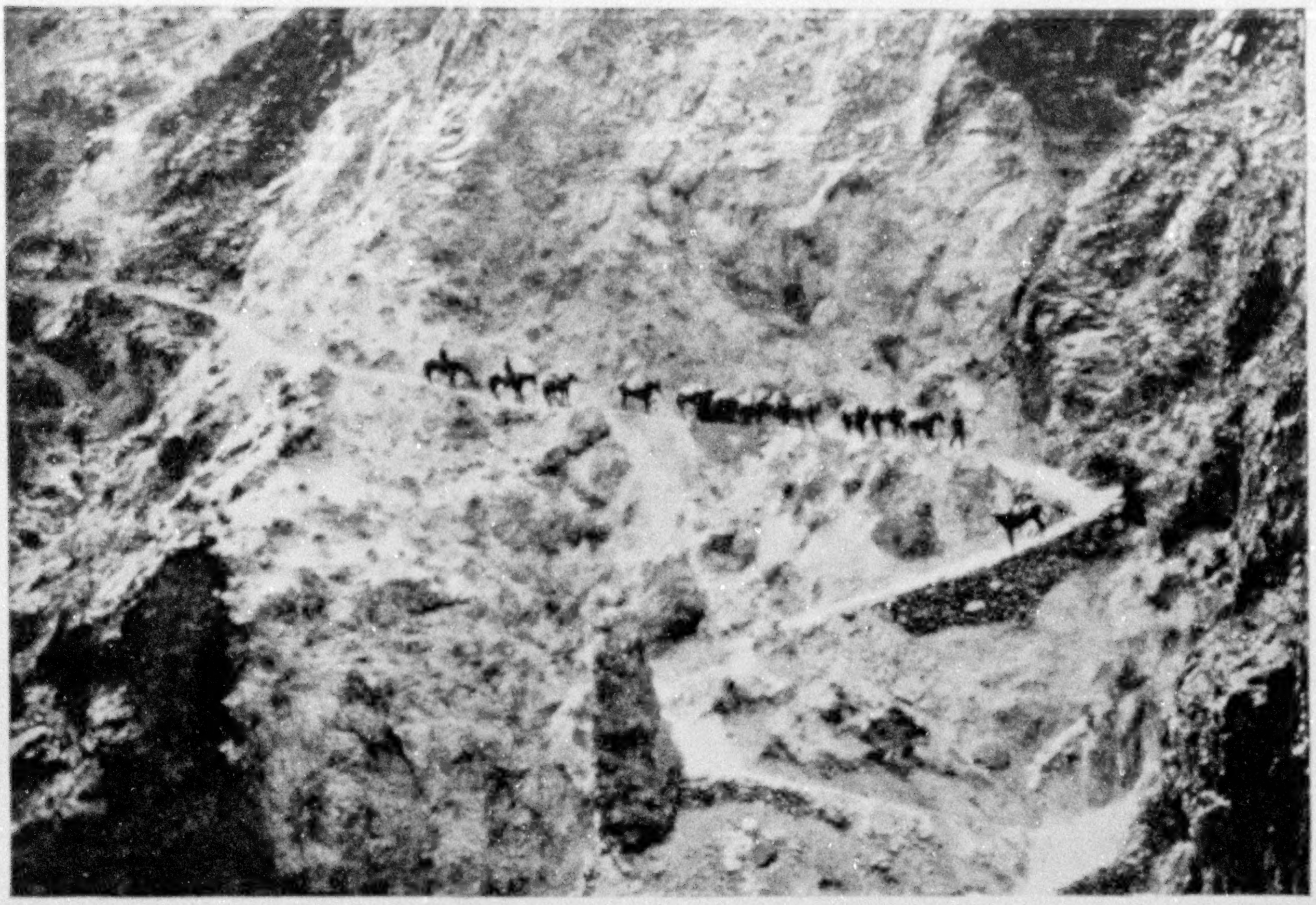
The pack-train, carrying the bridge material from railroad to river, made its half-way camp at Pipe Creek. Here only a lonely black kitten greeted us. The pack-train was "on the job." It has been a tremendous undertaking to move the lumber, cement, and cables down the 11 miles of steep, winding trail to the bridge site. Many are the exciting tales told by the packers. On one trip a horse



Photograph by Kolb Brothers

PACK-TRAIN CARRYING LUMBER DOWN TO THE BRIDGE SITE

"It has been a tremendous undertaking to move the lumber, cement, and cables down the 11 miles of steep, winding trail to the bridge site."



Photograph by Kolb Brothers

THE PACK-TRAIN MAKING ITS TORTUOUS WAY TOWARD THE RIVER BED

In transporting the material from the rim of the Grand Canyon to the suspension bridge camp site many difficulties were encountered. On one occasion one of the pack-horses went over the cliff, carrying two other animals with it. Only the resourcefulness and daring of one of the men saved the remainder of the train by cutting the ropes.

went over the cliff, carrying two others with him; but a resourceful lad cut the rope and saved the remainder of the train.

Since January these pack-trains have been steadily trudging up and down between the hidden river and the railroad on the rim.

A REHEARSAL FOR CARRYING THE CABLES

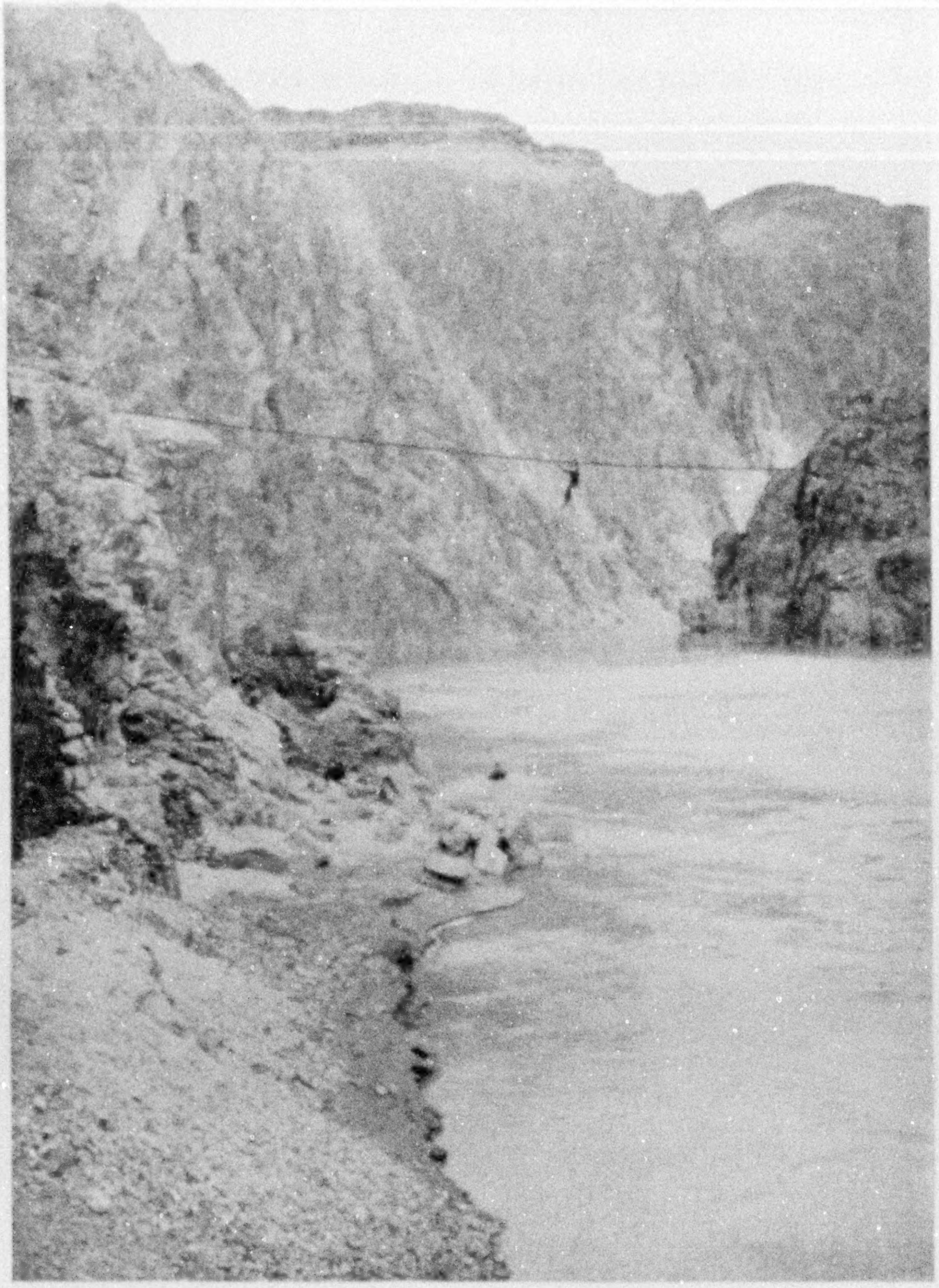
The transportation of the 1,200-pound cables alone marks an epoch in bridge-building. The superintendent of the Grand Canyon National Park, who supervises the bridge-work, is an engineer whose varied experience ranges from setting the official height of Mount McKinley, in Alaska, to locating a Patagonian railroad. He conceived the idea of "rehearsing" the carrying down of the cables by estimating, with ropes, just the proper length of line necessary between each mule, as the train swung around the curves. The 1,200-pound cable was then loaded on to eight mules roped together, with the weight evenly divided, a man walking at the head of each mule.

The sun was high in the heavens as we made the final drop down the newly cut trail in the granite wall to the bridge camp by the river. There were three sleeping tents in the camp, a dining-room tent, and a kitchen. The cook played star rôle. It is he who makes or breaks a camp. This particular cook put Broadway chefs to shame, in spite of the fact that everything but the water had to be packed down from above.

A 420-FOOT BRIDGE

I was fortunate in having the contractor himself explain the bridge to me.

The completed bridge will be 420 feet along the roadway, with a span of 500 feet from center to center of the bearings. The two main steel cables are placed about 10 feet apart and are anchored to the canyon walls 80 feet above the floor level, by means of sections of 80-pound railroad iron set into the rock with concrete.



Photograph from Harriet Chalmers Adams

SWINGING ACROSS THE COLORADO RIVER GORGE ON A WIRE CABLE

This method of crossing the canyon was employed during the work of constructing the suspension bridge.

Hanging galvanized steel cables, clamped to the main lines above, carry the wood floor of the bridge. A seven-foot wire meshing is strung along the sides as a protection for animals and pedestrians.

The bridge is 60 feet above the river in normal flow and 13 feet above the highest known water-mark in June floods. This is the only bridging of the Colorado above Needles, California, 360 miles to the south by river curve, as you "step it off" on the map.

Now for the bridge crew. Never have I seen a finer-looking lot of men—typical Americans, brawny and bronzed, not a pound overweight. One used to be a lumber cruiser in Alaska; another has mined in southern Chile; a third was a cowboy "before they fenced in the whole bloomin' Southwest." One is an amateur astronomer, who spends his evenings with his telescope under the stars. He says you can see the stars better from the depths of a canyon. Several go in for photography. One has a gift for whistling and can imitate the bird calls. There is a good bit of poetry and adventure nailed into the Grand Canyon bridge.

Night in the Granite Gorge of the Colorado! They gave me the tool and meat tent for an abode. I recalled a game we played in childhood, "Heavy, heavy, hangs over your head!" It turned out to be the bacon. The framework of my tent was formerly the iron cage in which the infrequent traveler crossed the river by cable. Colonel Roosevelt crossed in this way on his ride up to the Kaibab forest.

A DEEP, MASTERFUL, SULLEN RIVER

When the camp slept and moonlight flooded the gorge, I slipped out of my sleeping-bag and walked to the river. The Colorado is a deep, masterful stream, sullen, unfriendly. No habitations border its canyon shores. It has a flow of 20,000 cubic feet per second, reaching a maximum of 200,000 cubic feet. By day its walls take on a strange, reddish-purple glow, but by moonlight they were softly pink. A weird rock,

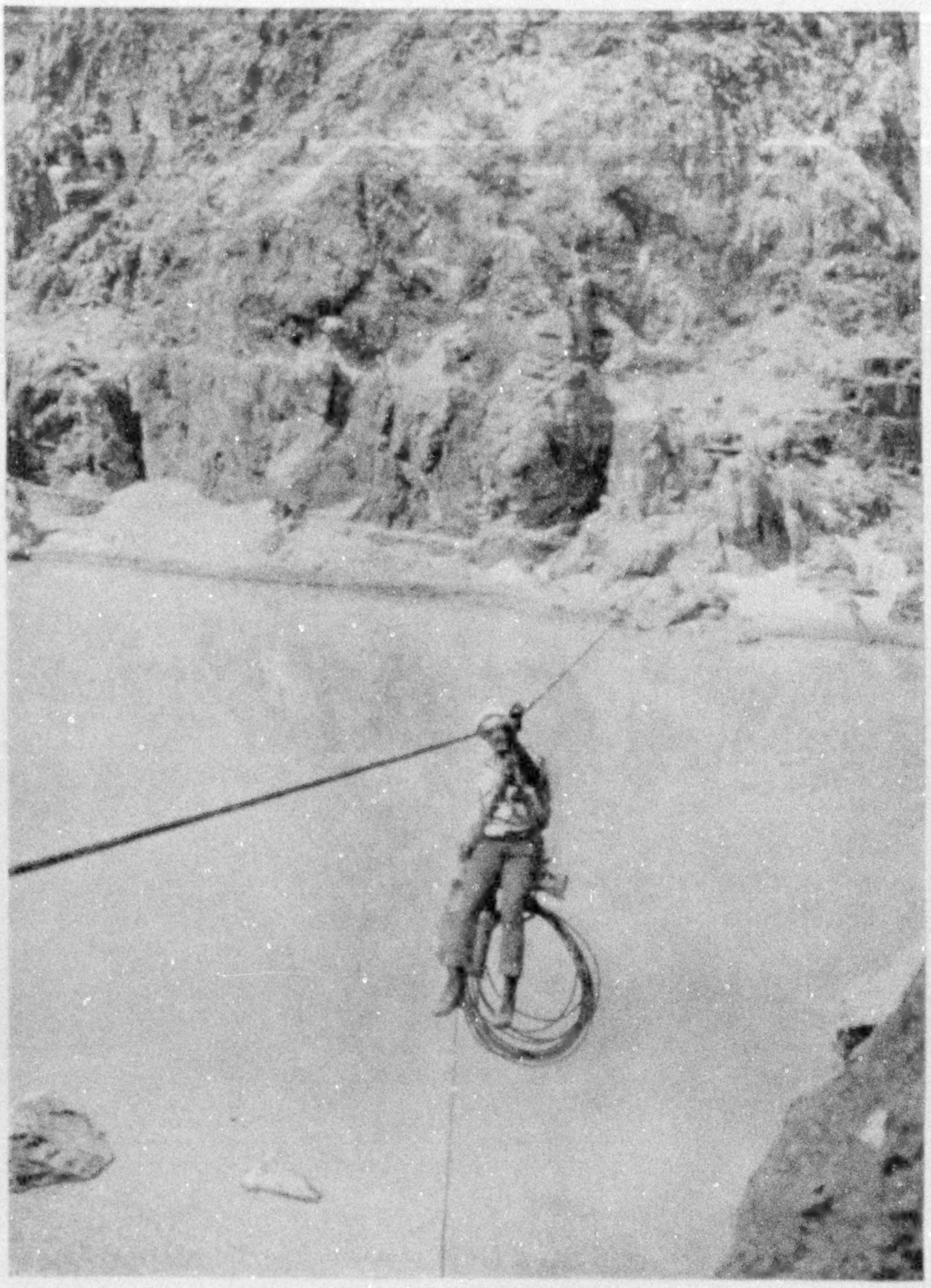
which they call the Temple of Zoroaster, dominated the scene. Jupiter rode high in the heavens.

Across the river lay the ruins of an ancient Indian village, its broken stone walls strewn with prehistoric pottery—coils and Greek-key patterns—such as are found among the Mesa Verde cliff-dwellings (see illustration, page 652). Perhaps it was never a permanent settlement, only a temporary winter refuge of some peaceful plateau tribe driven down from the heights by the warring Utes. The early chroniclers of the canyon did not mention these Indians.

Who will write the long-ago romances and tragedies enacted within this mighty gorge?

A chill wind swept down the canyon and I crept back to my tent.

Next morning, when the 10 o'clock sun looked over the cliff, we crossed the river in a canvas boat, rowing well upstream and coming back with the current to the landing beach. The boat leaked. It is difficult to swim the river because of the heavy sand and silt; but in case of an upset one would probably be tossed up on the rocks before reaching the rapids.



Photograph from Harriet Chalmers Adams

THE FLYING-MACHINE, THE GRAND CANYON BRIDGE CREW CALLED IT

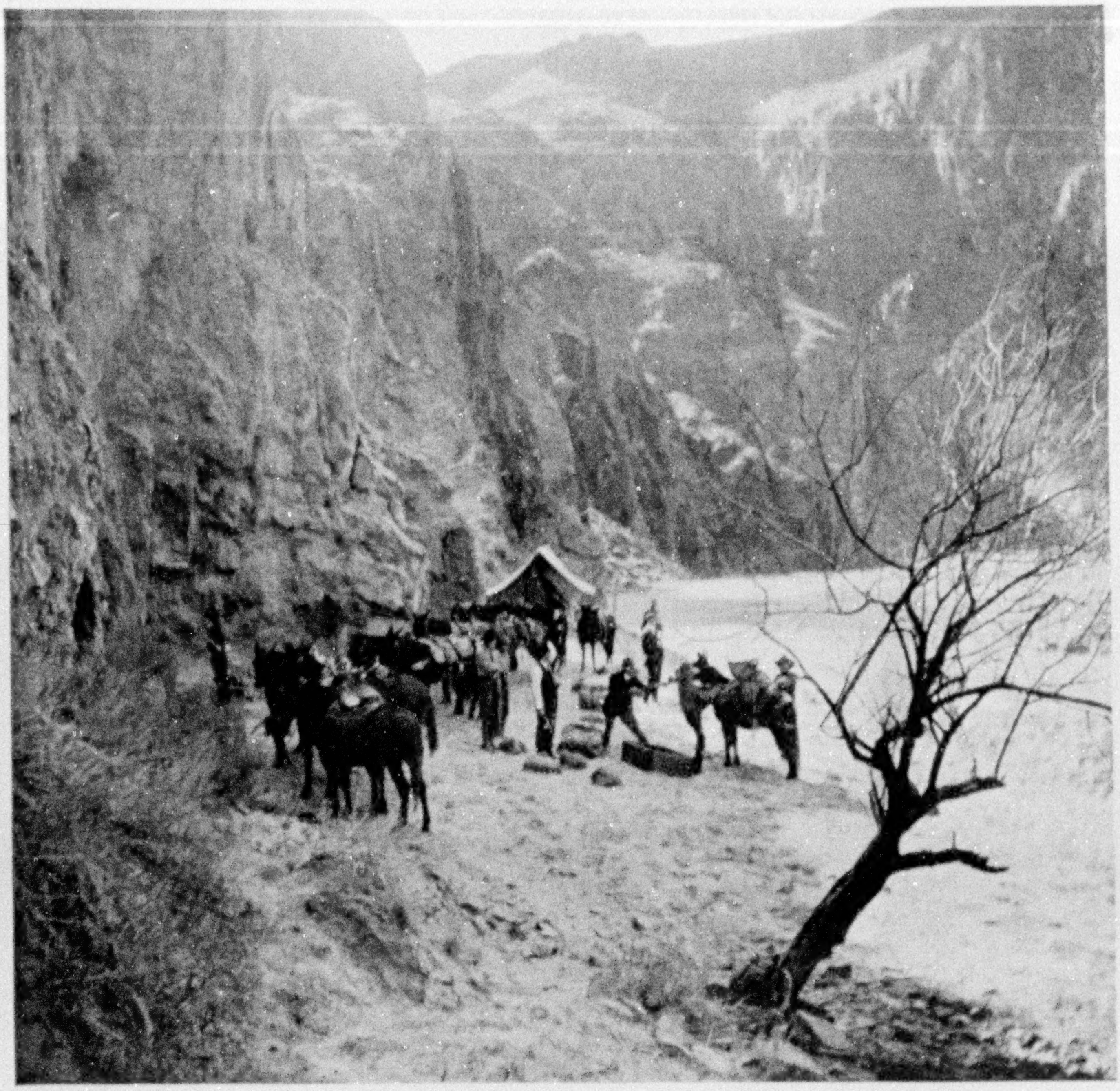
They went down by gravity and pulled up by hand on the other side.

LITTLE BRIGHT ANGEL, THE BRIDGE MASCOT

We climbed the bed of Bright Angel Creek, which here enters the Colorado, to the clump of cottonwoods still called "the Roosevelt camp." Here we discovered the bridge mascot, Little Bright Angel, a gray burro who lives in Elysian Fields, with clear water, plenty of grass, and a care-free life. We fed him pancakes sent by the cook, his favorite dish.

There are 113 crossings of the creek on the trail up Bright Angel Canyon to the north rim, and the little burro knows every one of them. Not long ago he guided the foreman of the bridge-crew up to the plateau, showing him just where to cross the stream.

I had heard that a distinguished American from Philadelphia, an enthusiast over the Grand Canyon, was to be the first to cross the Grand Canyon bridge; but the foreman told me, somewhat confidentially, that Little Bright Angel would be the first fellow across.



Photograph from Harriet Chalmers Adams

THE PACK-TRAIN ARRIVING AT THE BRIDGE CAMP, ON THE BANKS OF THE COLORADO

The camp consisted of five tents. Three were used as sleeping quarters for the bridge crew, one for a dining-room, and the fifth for a kitchen.

"You see," he explained, "Bright Angel has stood so long on the north shore of the river hoping to get across. He can't swim over, and he doesn't like the canvas boat."

Up in the Kaibab forest—"the island forest," a great naturalist has called it—live wild animals which have developed on original lines. The Kaibab squirrel and its cousin, the Albert, with their broad feathery tails, are the only American squirrels with conspicuous ear-tufts.

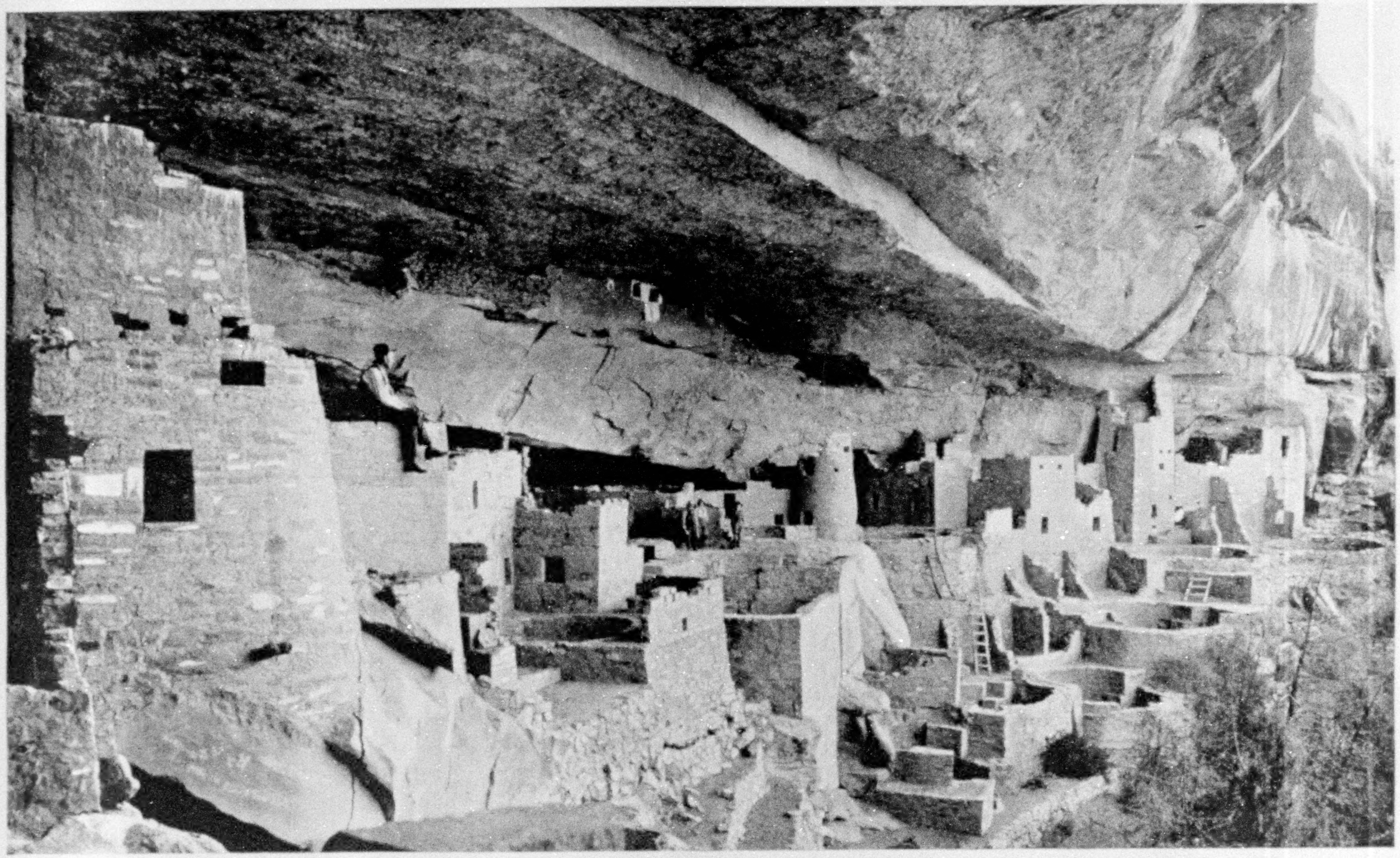
The herd of deer, variously estimated at from 12,000 to 15,000, are the mule deer, with large, broad ears and rounded, whitish tails, tipped with black. Where there are deer, there are pumas, or mountain-lions. They call them cougars in this part of the country. Uncle Jim Owens, an old-timer on the north rim, has hung out a sign: "Cougars killed to order." He has a record of 1,100 skins. His cabin walls are covered with them.

Other beasts of prey are the big gray timber-wolf, the coyote, and the fox. A man who lives here and explores unfrequented cliffs tells me there are antelope on the green shelf under the north rim. "Uncle Jim" has a promising buffalo herd, 64 in all. Isolated on a promontory and protected, the herd is sure to increase.

© Frederick I. Monsen

TINY "WARRIORS" OF THE "PEACEFUL PEOPLE": ARIZONA

These Hopi youngsters are "children of the sun" in a double sense. They are dedicated to that luminary deity by their parents, and are completely exposed to its penetrating desert rays until they are well in their 'teens. As their name signifies, the Hopi Indians are pacific; but they are far from being pacifists. Their "standing army" consists of a clan in which every mother raises her son to be a warrior, just as certain other clans are entrusted with the perpetuation of the Snake Dance and similar customs. The extinct Chaco Canyon pueblo people (see "A New National Geographic Society Expedition," pages 637 to 643) may have had an even more complex social organization, for they dwelt in apartment-houses compared to which many pueblo dwellings are but groups of cottages.



CLIFF PALACE: MESA VERDE

This most celebrated of Mesa Verde ruins is an example of a pueblo type in contrast to that of Bonito. The forgotten people of the Chaco found in canyon depths a refuge which the Mesa Verde dwellers utilized a cliff to attain. Recently a subterranean entrance was discovered to this "palace" of 200 rooms.

Photograph by Charles Martin

WHERE NATURE UPSET HER PAINT-POT: CANYON DE CHELLY

Bright red sandstone cliffs, piercing the sky to heights ranging between that of the Washington Monument and of the Eiffel Tower, sheltered a prehistoric people, probably of the same general period as those of Chaco Canyon. This most brilliantly colored of all the canyons of the Southwest lies in the heart of the Navajo Desert, northeastern Arizona.

Photograph by Frederick I. Monsen

HOPI BOYS OF WALPI, ARIZONA

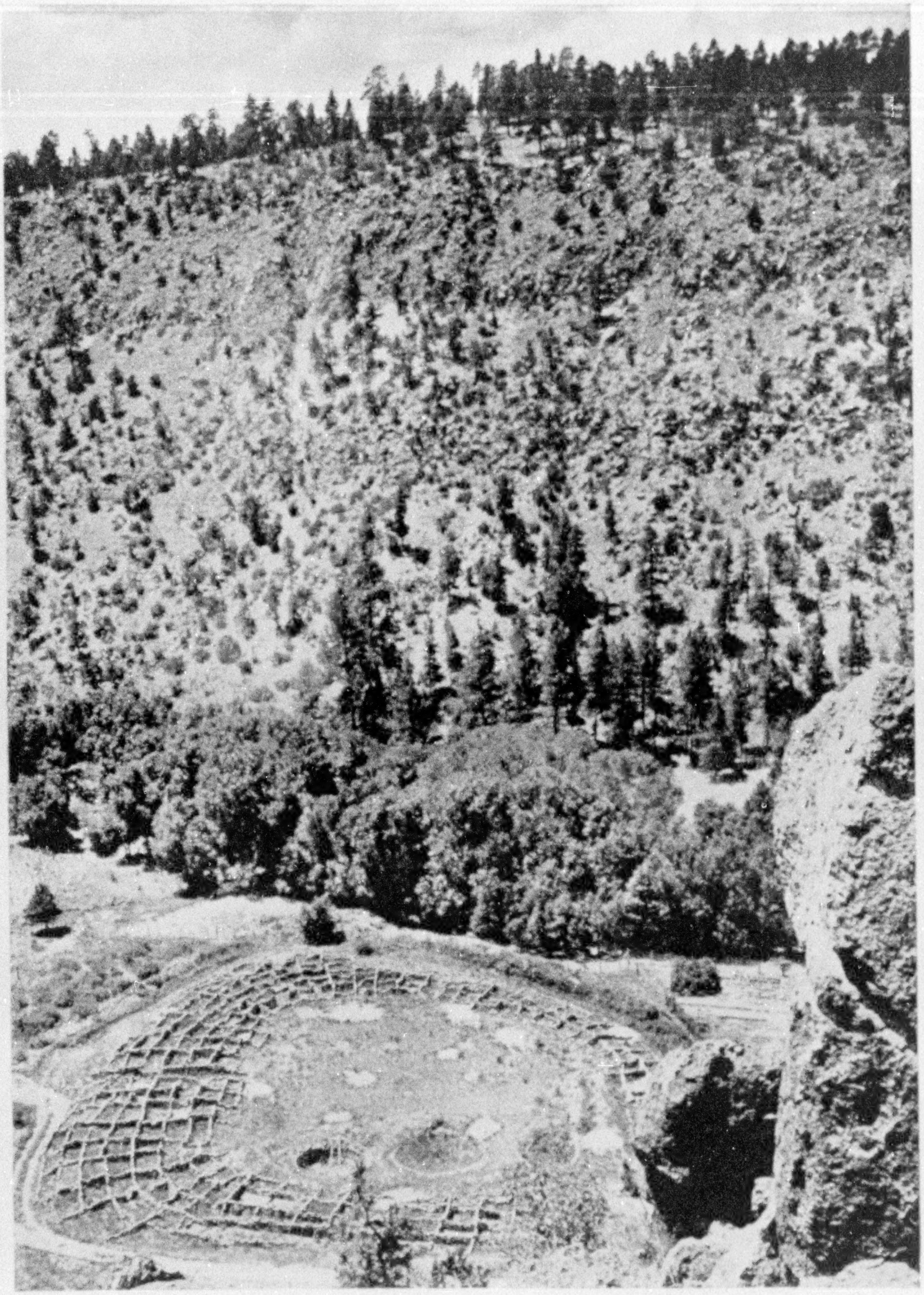
Walpi has a cliff-top location comparable to the monasteries of Meteora, Greece. Climbing along a steep trail, where ladders formerly had to be used at some stages, has developed a lithe, agile people. Hopi children are among the handsomest of the Pueblo Indians, though their symmetry sometimes is marred when their heads have been flattened by the cradle-board.

Photograph by Charles Martin

HOPI POTTERS OF ARIZONA ENGAGED IN AN ART THAT SURVIVES THE CENTURIES

Compared with these Indian workers of 1921, Cape Cod fishermen are followers of an infant American industry. Ceramics have more than an esthetic significance. Pottery making, for example, is indicative of a pueblo people, for the ware is too fragile for nomad use.

XUM



Photograph by Charles Martin

EL RITO DE LES FRIJOLES (LITTLE CANYON OF THE BEANS): NEW MEXICO

The honeycomb circlet in the foreground is the pueblo ruin of Tyuonyi. This photograph was taken from the top of a cliff along whose base for three miles stretches a series of "talus pueblos," a type of dwelling also found in Chaco Canyon (see text, page 640).

Photograph by Charles Martin

CANYON DE CHELLY MONUMENT: ARIZONA

In the shadow at the base to the right a cliff dwelling was found. On a ledge just above is a man, whose form is a tiny speck against this lone sentinel among the fantastic "back-drops" of multihued canyon walls.

XUM

Photograph by Charles Martin

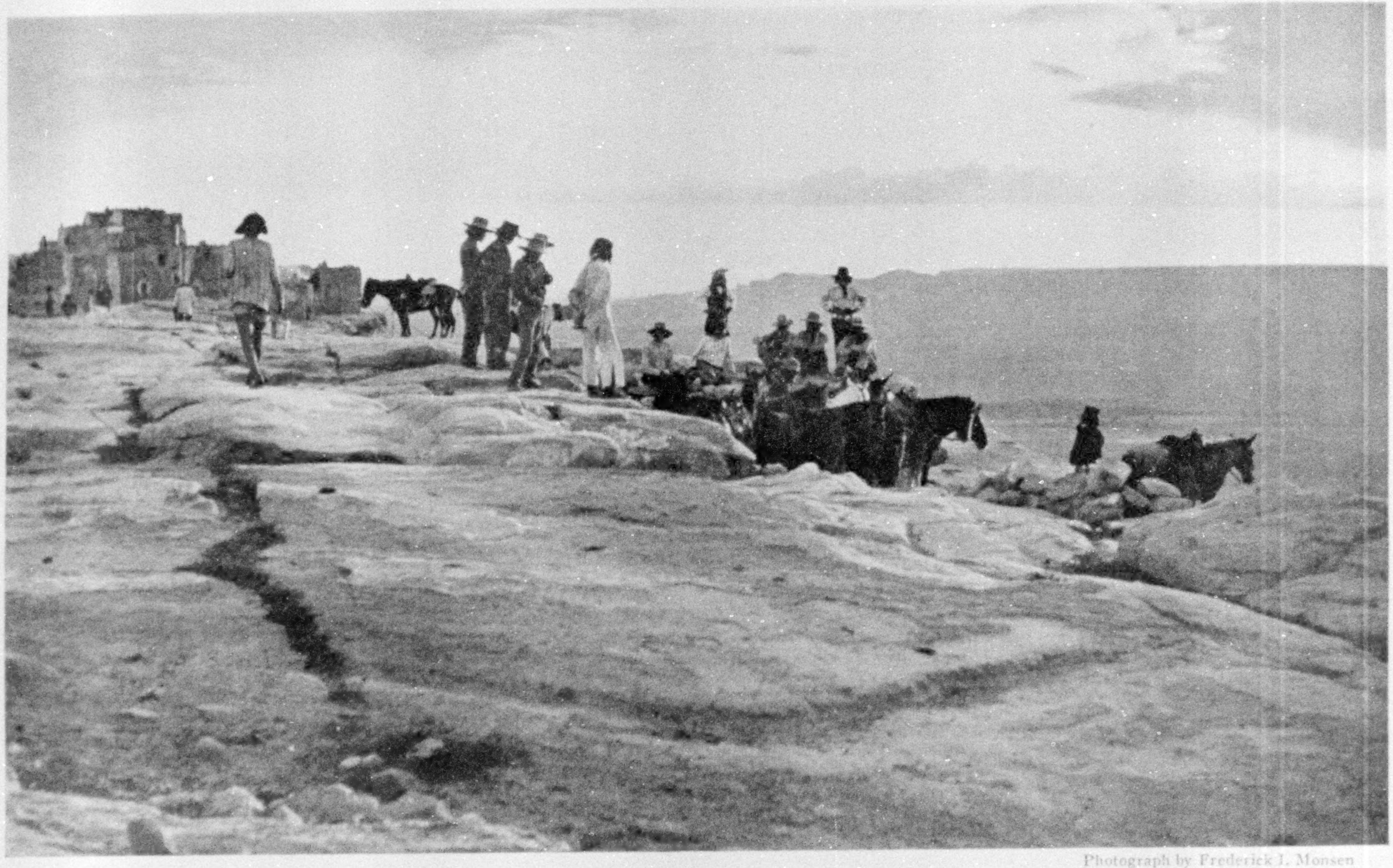
"BRACED-UP" CLIFF AT PUEBLO BONITO, CHACO CANYON

The scattered stones at the bottom of this leaning tower of Chaco are an enigma. They represent a naïve effort to prop up a massive cube of solid rock on the part of these aboriginal engineers, who exhibited contrasting skill and acumen in the construction of Pueblo Bonito, to the left (see also text, page 641).

Photograph by Charles Martin

CANYON DEL MUERTO, A BRANCH OF CANYON DE CHELLY: ARIZONA

Cliff dwellings abound on nearly every ledge. It is not strange that peoples living in such an environment should conceive man to have emerged from a vent in the earth's surface.



Photograph by Frederick I. Monsen

EVENING EFFECT: WALPI, ARIZONA

Like the people of San Marino, who climbed a mountain to live in liberty and serenity, the Hopi, self-styled "People of Peace," took refuge in the cliffs of northeastern Arizona to avoid constant warring with cruder tribes. Walpi is on the summit of a sheer cliff.

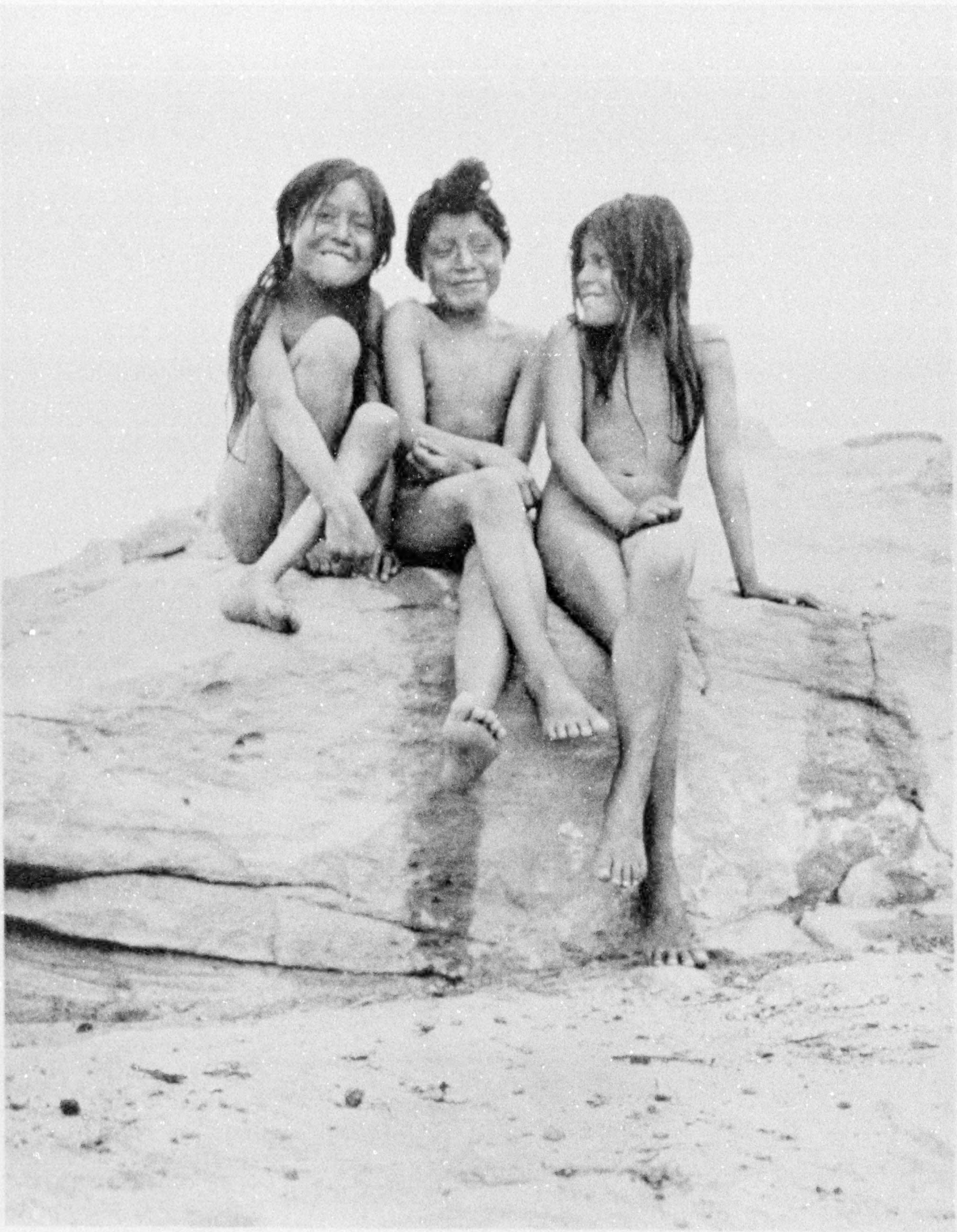
Photograph by Frederick I. Monsen

THE PAINTED DESERT : ARIZONA

Photograph by Charles Martin

GIRL OF ORAIBI, THE METROPOLIS OF THE HOPI

Among the Hopi, famous for their snake dances, skill in weaving, dyeing and embroidery, and complex mythology, may be found lore which will provide clues to the Chaco Canyon people.



Photograph by Frederick I. Monsen

THREE LITTLE MAIDS AWAY FROM SCHOOL: HOPI INDIANS, ARIZONA

The white man is proud of his juvenile courts; the Hopi red man is proud that he has no need for such institutions. A Hopi father considers it an essential duty to teach his children to abhor lying and stealing, to respect and obey their elders, and to be self-supporting.

Photograph by Frederick I. Monsen

AN OLD WAR CAPTAIN OF LAGUNA PUEBLO, NEW MEXICO

The bow and arrow today are relics of bitter tribal wars of long ago. A more potent mace is a cane, prized by many council chiefs, who hold this symbol of prestige because of a visit to the "Great White Father" in Washington. Some of these canes have been handed down from patriarchs who made the cross-continent journey during Lincoln's administration.

As summer breezes, stealing
Fill woods and fields with song,
This soup will keep you feeling
Light-hearted all day long.

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A whiff of the savor from off the fire! A plate set out before you, steaming its invitation! The first delicious, invigorating spoonfuls! And then the glow of pleasure and satisfaction that comes over you! Right from nature comes

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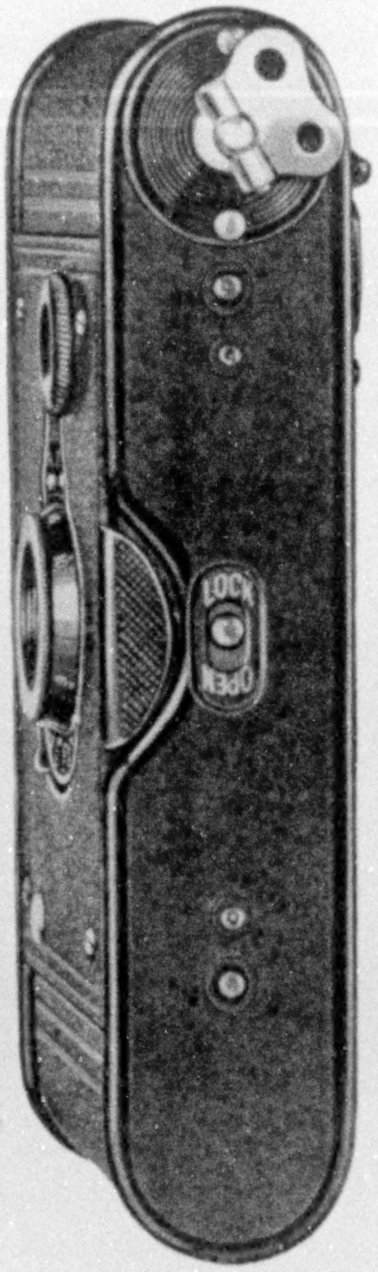

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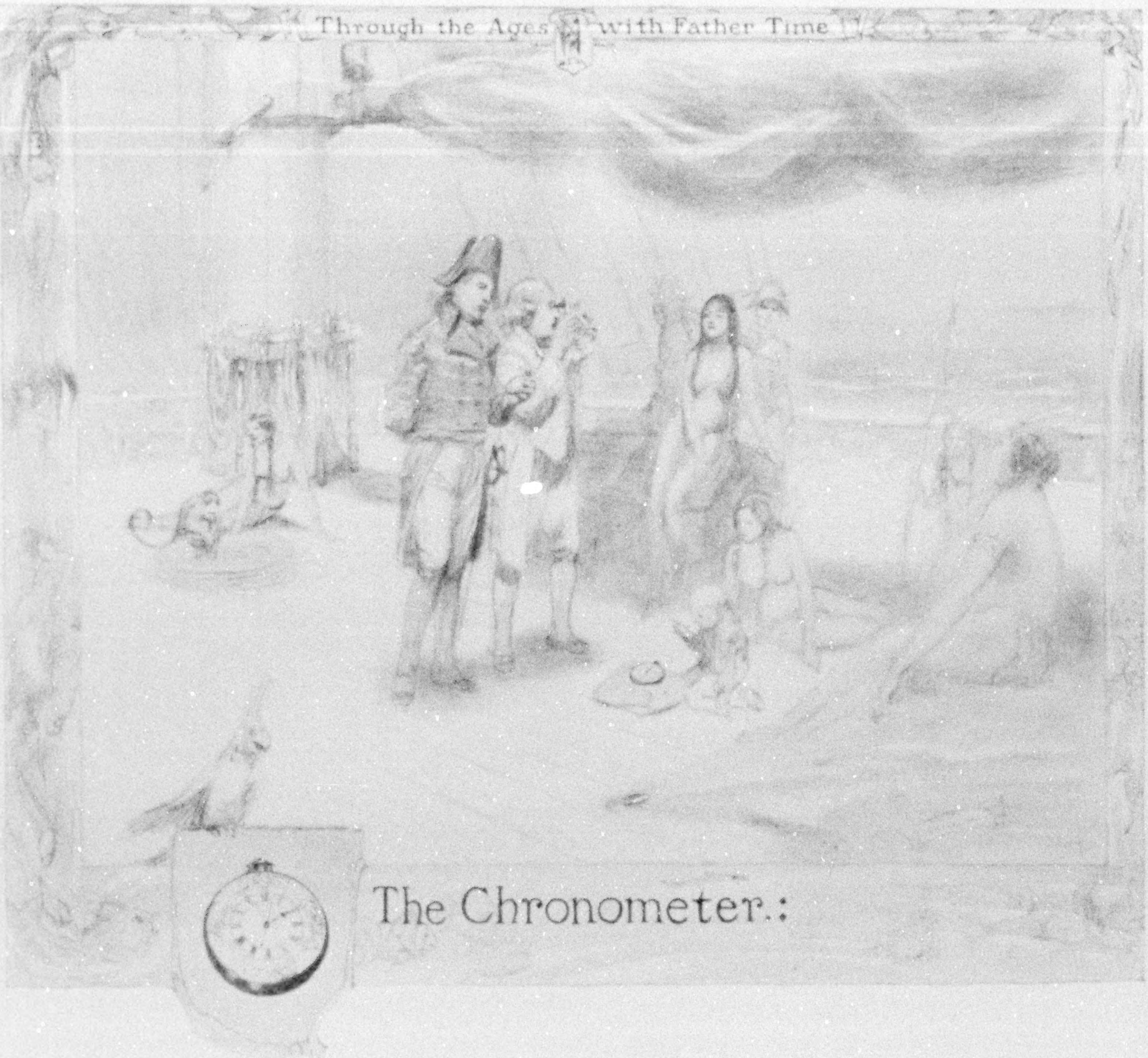

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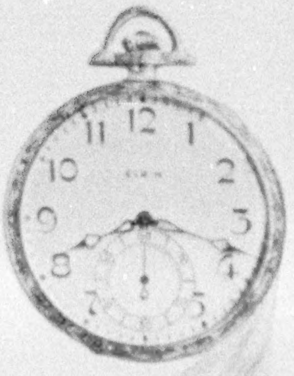

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5—Empire State, July 23d.

Europe to New York via Danzig and Bremen.
6—Susquehanna.
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Europe to New York via London and Boulogne.
6—Panhandle State, June 9th.

New York to Europe via Boulogne and London.
6—Old North State, June 7th.
Return to New York via London and Boulogne, June 23d.

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6—Antigone, June 25th.
Return New York via Danzig, July 16th.

New York to Europe via Boulogne and London.
6—Panhandle State, June 28th.
Return to New York via London and Boulogne, July 14th.

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6—Susquehanna, July 5th.
Return New York via Danzig, July 24th; via Bremen, July 29th.

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6—Old North State, July 12th.
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6—Panhandle State, August 2d.
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6—Old North State, August 16th.
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New York to Europe via Bremen and Danzig.
6—Susquehanna, August 18th.
Return New York via Danzig, September 6th; via Bremen, September 10th.

New York to Europe via Boulogne and London.
6—Panhandle State, September 6th.
Return New York via London and Boulogne, September 22d.

New York to Europe via Boulogne and London.
6—Old North State, September 20th.
Return New York via London and Boulogne, October 6th.

Italy to New York via Genoa and Naples.
6—Pocahontas.
Return New York from Genoa, June 9th; from Naples, June 11th.

New York to Italy via Naples and Genoa.
6—Princess Matoika, June 2d.
Return New York from Genoa, June 23d; from Naples, June 25th.

New York to Italy via Naples and Genoa.
6—Pocahontas, June 30th.
Return New York via Genoa, July 21st; via Naples, July 23d.

New York to Italy via Naples and Genoa.
6—Princess Matoika, July 14th.
Return New York via Genoa, August 4th; via Naples, August 6th.

New York to Italy via Naples and Genoa.
6—Pocahontas, August 11th.
Return New York via Genoa, September 1st; via Naples, September 3d.

New York to Italy via Naples and Genoa.
6—Princess Matoika, August 25th.
Return New York via Genoa, September 15th; via Naples, September 17th.

New York to Italy via Naples and Genoa.
6—Pocahontas, September 22d.
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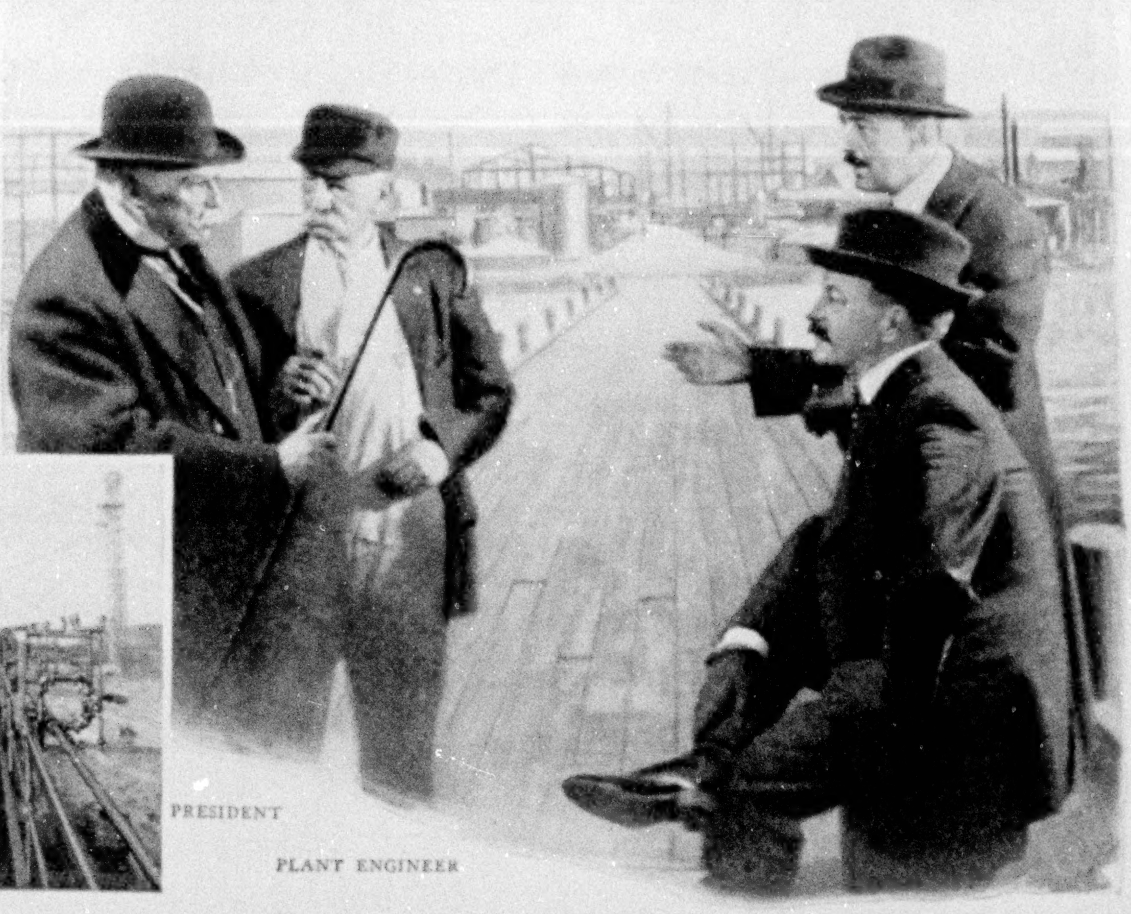
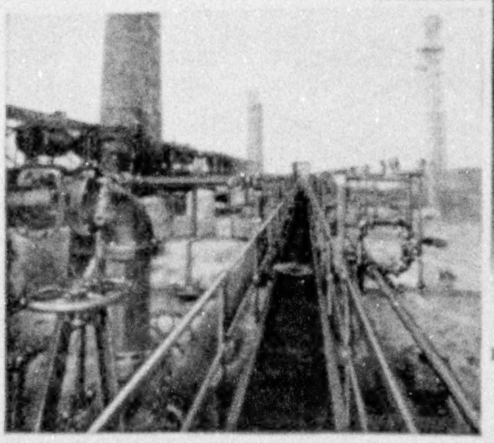
Dramatized Facts out of The Day's Work

No. 4

Where the facts came from

Building the new New England Oil Corporation plant at Fall River, Mass., was a rush job from the first day. 68 miles of piping, covering 55 acres, were installed by Grinnell Company for the contractors, Unit Construction Co., St. Louis. When the piping was tested only six leaks were reported to Mr. W. W. Boyd, Jr., Vice President and General Manager of the New England Oil Corporation —6 leaks from 64,332 joints.





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"The first tanker will dock here in just four months," declared the President, looking across the fifty-five-acre site of the gigantic new oil works. "By then we simply must be in full running order."

"And that includes piping," mused the Production Manager.

"It can't be done," exclaimed the Plant Engineer. Why, there's more than 68 miles of piping required here."

"I don't care if there's a hundred and sixty-eight," flashed the President, "this job's got to go through on schedule."

"But sixty-eight miles of piping—" the Plant Engineer came back, "high and low pressure steam lines, acid, air and water lines, besides connections to stills and coking plants—why there's over fifty thousand joints to make trouble."

The Consulting Engineer turned—started to reply. But again the President broke in—"Not more than four months, remember."

"All right," persisted the Plant Engineer, "but if you rush construction like that, you can figure on acres of leaky joints after the construction army is gone—."

"You're borrowing trouble, old man," smiled the Consulting Engineer. "I'll bet you a suit of clothes there won't be a hundred leaks in the whole job when it's tested."

"Only a hundred leaks in 68 miles of rush piping? I'll go you."

It was hardly a fair bet. For the Consulting Engineer knew the service he would get from Grinnell Company. And his confidence wasn't misplaced. The job was done on time, and after the test only six leaks were reported. He won his suit of clothes with ninety-four leaks to spare!

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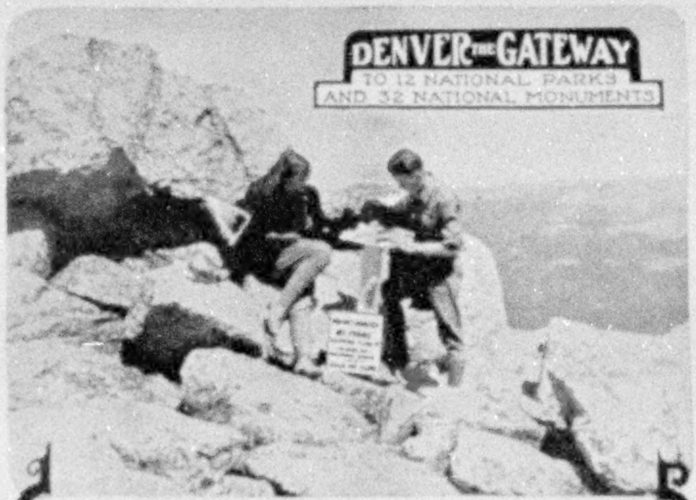

PEAK TO PEAK TRIP

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How Pretty Teeth

are ruined during sleep

When you retire with a film on your teeth, it may all night long do damage.

Film is that viscous coat you feel. It clings to teeth, gets between the teeth and stays. The tooth brush does not remove it all.

That film causes most tooth troubles. So millions find that well-brushed teeth discolor and decay.

How film destroys

Film absorbs stains and makes the teeth look dingy. It is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea.

Few escape its damage. So dental science has for years been seeking a film combatant.

New Methods found

Now ways have been found to fight film and film effects. Able authorities have proved them. The ways are combined in a dentifrice called Pepsodent. Leading dentists everywhere advise it. And millions of people every day enjoy its benefits.

Watch it for ten days

This offers you a 10-Day Tube. Get it and watch its effects.

Each use of Pepsodent brings five desired effects. The film is attacked in two efficient ways.

It multiplies the salivary flow. It multiplies the starch digestant in the saliva, to digest starch deposits that cling. It multiplies the alkalinity of the saliva, to neutralize the acids which cause tooth decay.

It also keeps teeth so highly polished that film cannot easily adhere.

These five effects, attained twice daily, have brought to millions a new era in teeth cleaning.

Send the coupon for the 10-Day Tube. Note how clean the teeth feel after using. Mark the absence of the viscous film. See how teeth whiten as the film-coat disappears.

Judge by what you see and feel. Our book will tell the reasons. This is too important to neglect. Cut out the coupon now.

Pepsodent REG. U.S. PAT. OFF.

The New-Day Dentifrice

A scientific film combatant combined with two other modern requisites. Now advised by leading dentists everywhere and supplied by all druggists in large tubes.

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10-Day Tube Free

THE PEPSODENT COMPANY,
Dept. 693, 1104 S. Wabash Ave., Chicago, Ill.:
Mail 10-Day Tube of Pepsodent to

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Only one tube to a family

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Each can of G. Washington's Coffee is equivalent to ten times its weight in roasted bean coffee. Mr. Washington's refining process has eliminated all woody fiber, chaff, and waste. Each cup made to order. Dissolves instantly. Always delicious, healthful, economical.

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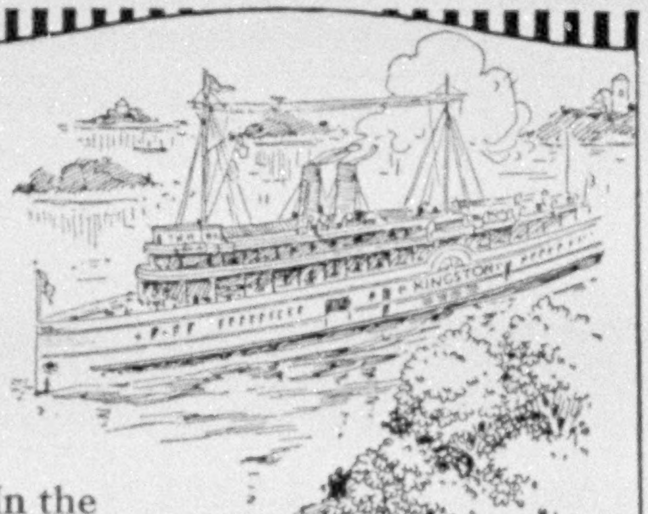

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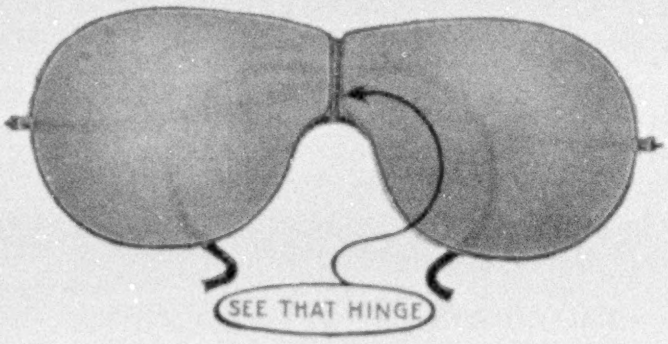

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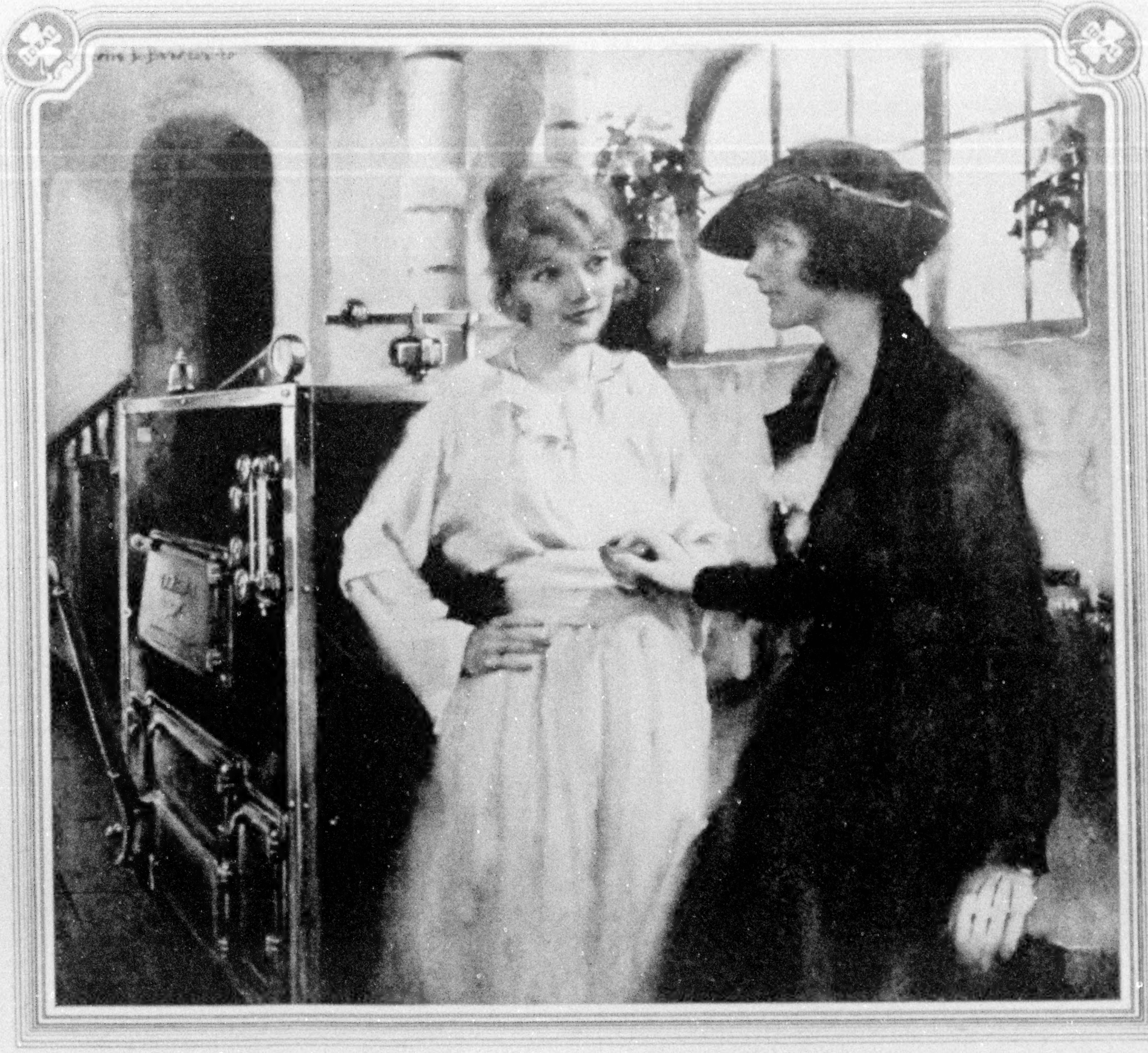

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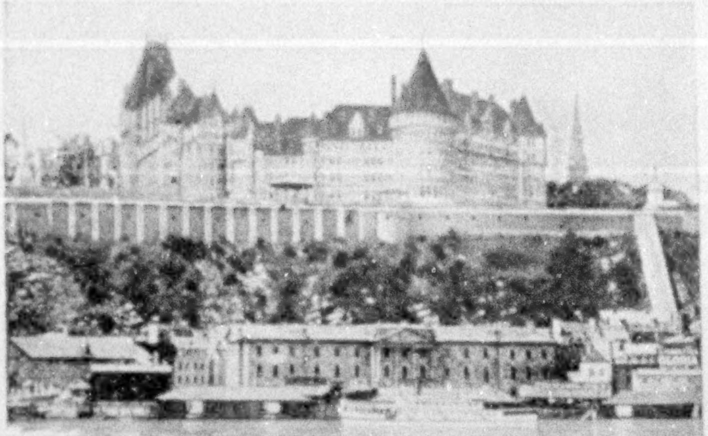

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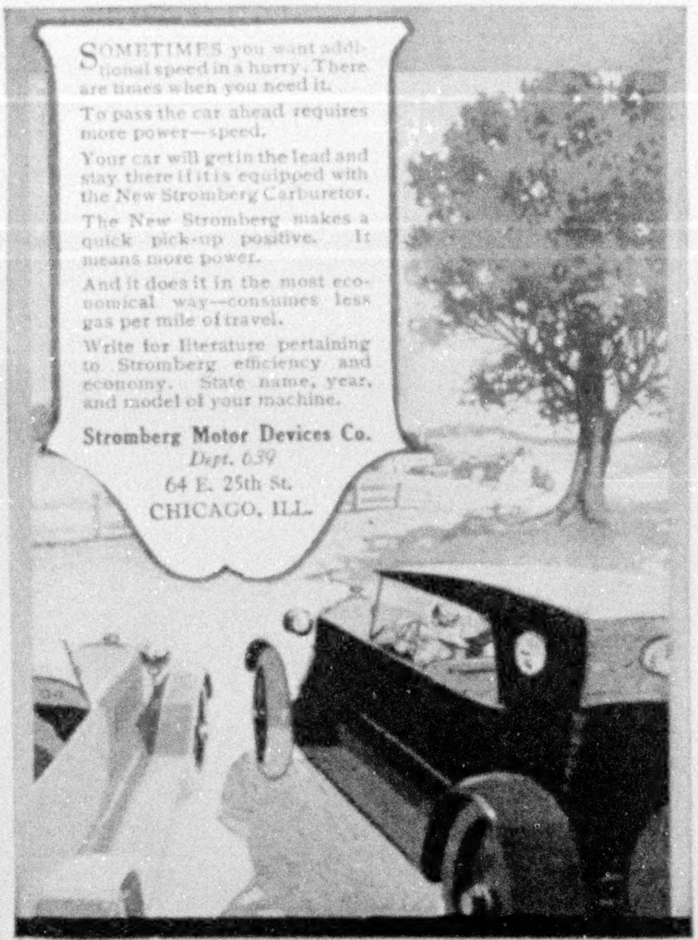

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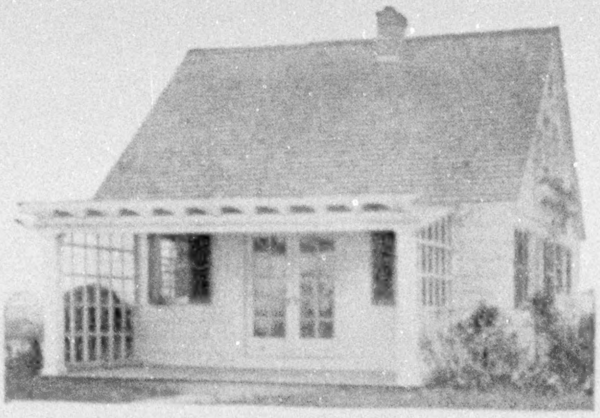

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is exceptionally rich in the elements needed to build young bodies strong and well; and it has a natural sweetness and charm of flavor for young and old.
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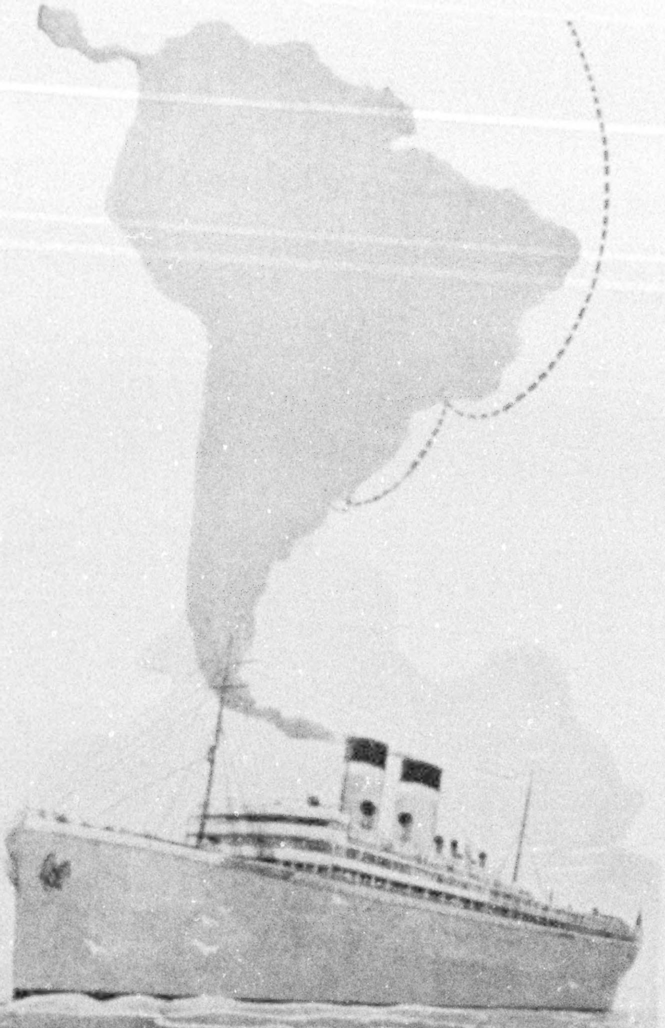

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See Yosemite this year. Write today for free Illustrated Descriptive Folder. Address

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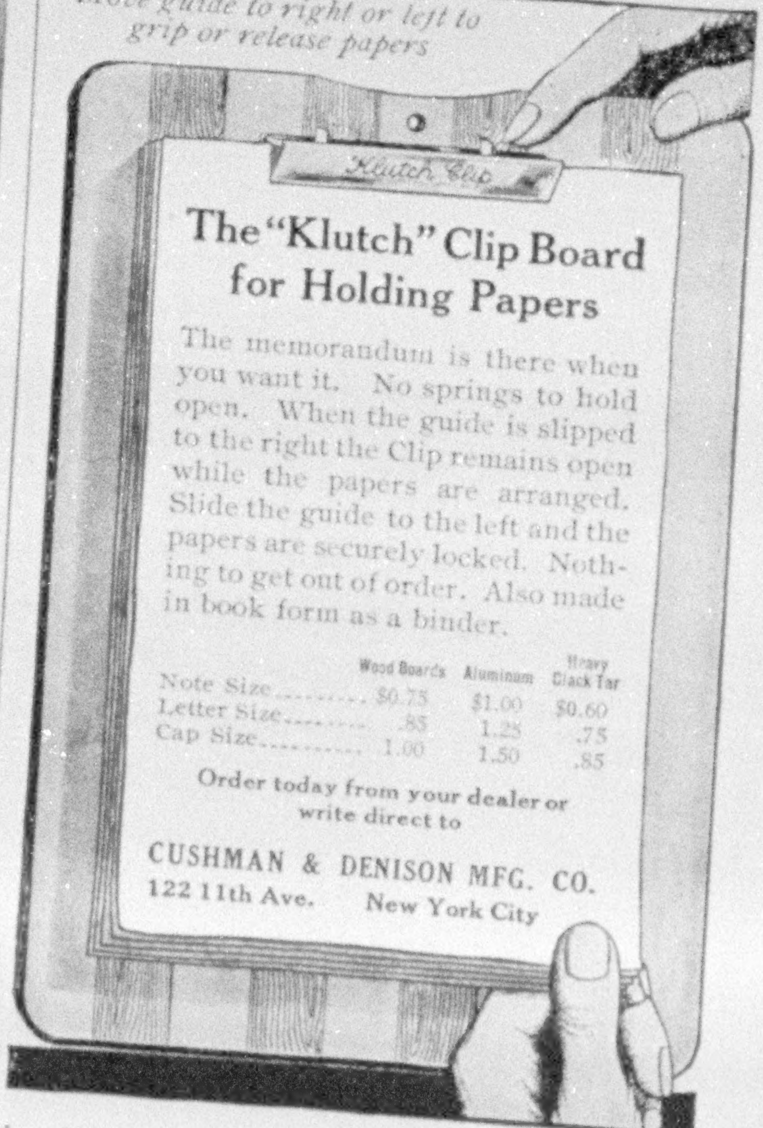
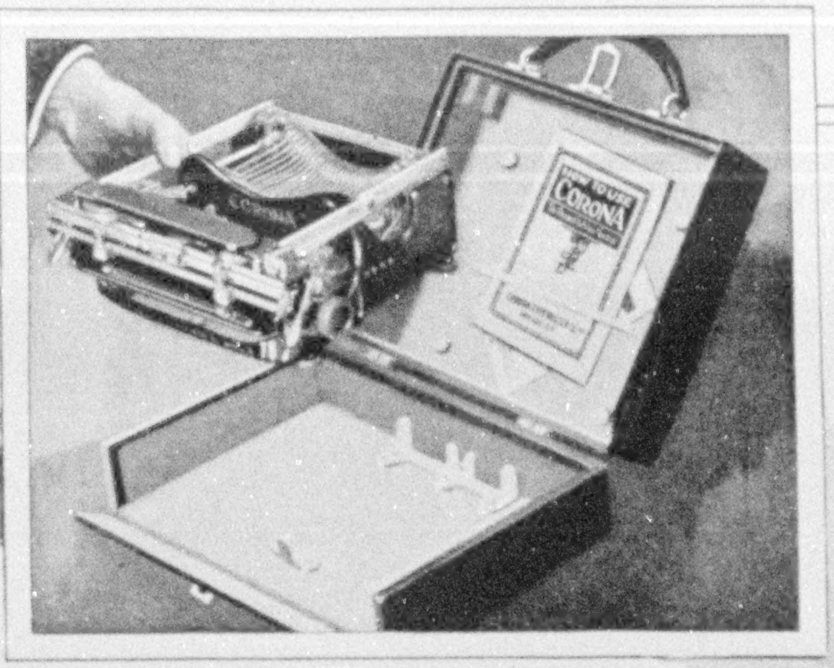
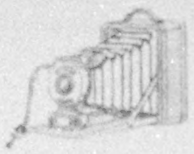




Now you will understand the reason why Corona folds



YOU wouldn't carry a jack-knife open; nor a book, nor a traveling bag, nor a fountain pen. When you want to use them they're open, when you carry them they're closed.

Merely as a contributor to your convenience Corona's patented folding feature would be tremendously worth while. But there is another and more fundamental reason why it is of so much importance to you.

In no other way could you have *all* of the advantages of a normal, practical typewriter without the weight and bulk of a "standard" machine.

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The Corona dealer can show you a half dozen advantages of the same character.

Ask him to show them. Open the case, unfold Corona and write—how responsive its action, how easy its touch. Fold it up, slip it back in its case and close the cover—now you'll understand the reason why Corona folds.

The price of a brand new Corona, including the carrying case, is only $50.00. You can rent a Corona for a small monthly sum, or you can buy one on easy payments.

"Fold it up—take it with you—typewrite anywhere"

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The Personal Writing Machine

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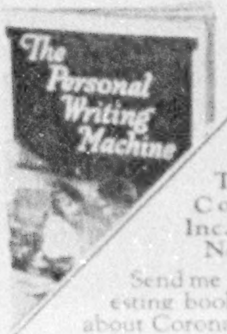
Built by CORONA TYPEWRITER COMPANY, Inc., Groton, N.Y.

There are more than 1000 Corona Dealers and Service Stations in the U. S.



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Send me your interesting booklet No. 66 about Corona.

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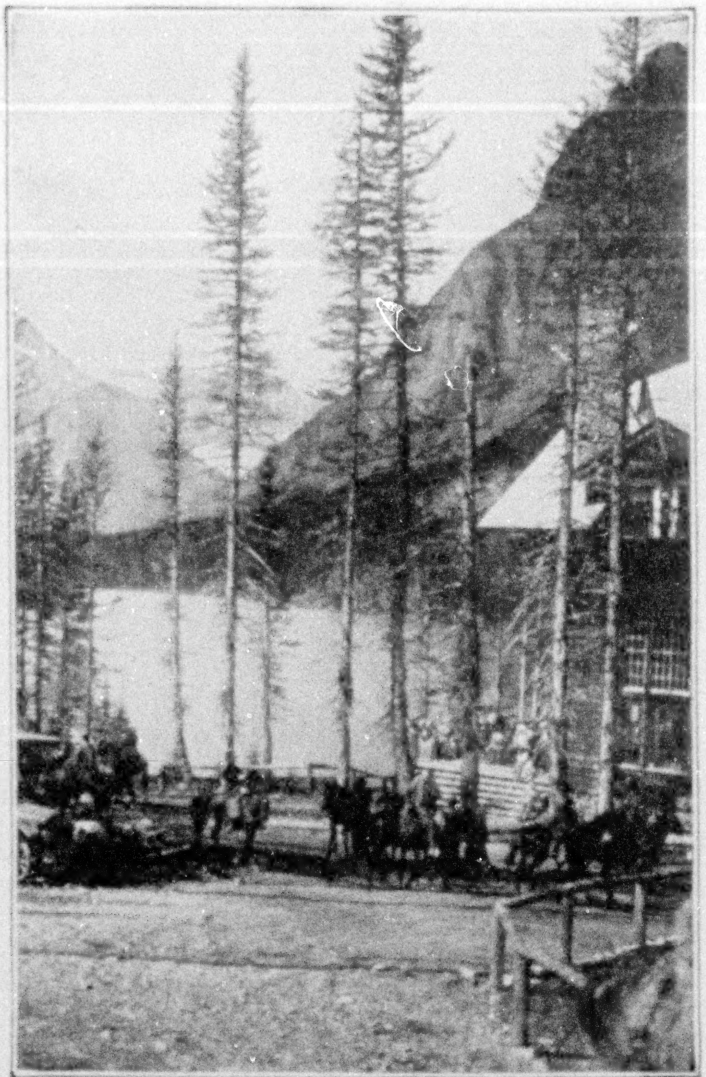
Address.............................



Glacier national park

June 15 to September 15

The wild Rockies are intimately yours in Glacier National Park

Modern hotels and Swiss chalets offer best accommodations. Tours via motor, saddle-horse, and launch arranged by day, week, or month. En route to North Pacific Coast, Alaska or California, visit Lake Chelan, Mt. Rainier and Crater Lake National Parks. "Glacier" is your only national park on the main line of a transcontinental railroad.

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Send for Glacier Park Literature

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GREAT NORTHERN RAILWAY
St. Paul Minn.

A. J. Dickinson, Passenger Traffic Manager
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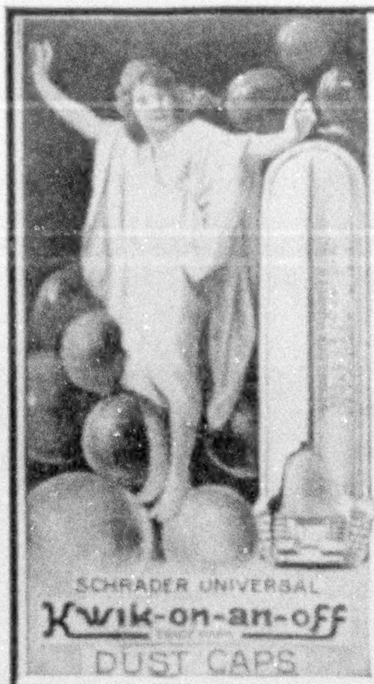
Dept. 37X, St. Paul, Minn.

Please send literature and aeroplane map of Glacier National Park.

Name ....

Address ....



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Kwik-on-an-off Dust Caps do these things effectively and without loss of time.

1921 Model Improved in Design

Guard Your Tire Valves

Slip them over Valve Stem and then turn to the right, like screw Dust Cap, until tight. When taking off reverse until loose.

On small diameter Tire Valves use Milled Rim Nut Bushings, on which Kwik-on-an-off Dust Caps fit perfectly.

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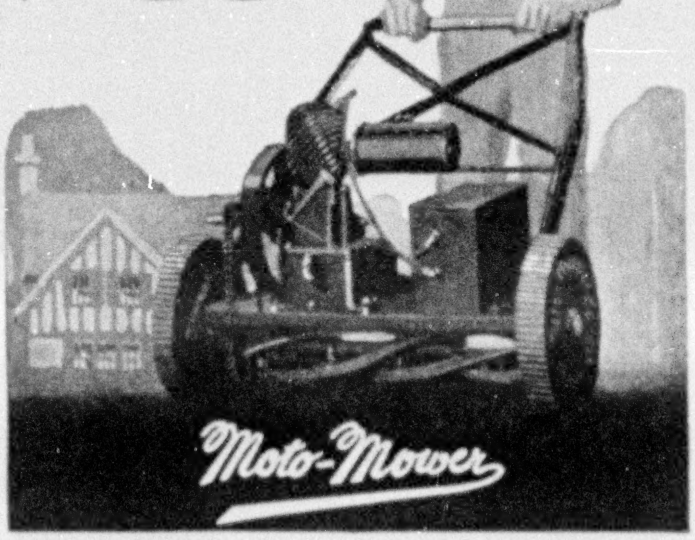

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E. A. MARSH
A Pioneer Inventor of Waltham Watchmaking Machinery

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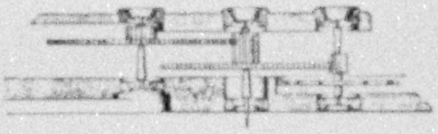


Waltham Scientific Jewel Bearings

Needle Gauge

The Jeweled Bearing Holes in a Waltham Watch Measure Only Six and One-Half Thousandths of a Centimeter

SPLIT a human hair into twelve equal parts. Then take up one of these tiny strands and you have the standard of measurement by which Waltham Watch accuracy is determined.

Now, split a human hair into two equal parts using one of these wee strands as the size of a diamond drill (for nothing but a diamond will drill a diamond) to make a hole in a pure sapphire or ruby jewel.

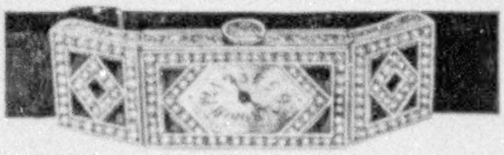
Then, to perfect the bearing surface of this hole, polish it out with diamond dust until it is the size of a hair.

We have related here one of the tasks that Waltham accuracy is able to perform due to machine-made tools and marvelous gauges (such as the gauge illustrated).

It is owing to this extraordinary standardization of parts and workmanship that Waltham has produced the most accurate small watch made in the world.

The foreign-made watch lacks this standardization. If you had the opportunity to compare under a powerful magnifying glass the material and workmanship in one of these fine Waltham Watches, with the crude and rough hand-made units in many of the foreign watches, there would never be any question what your choice would be, at any price.

This story is continued in a beautiful booklet in which you will find a liberal watch education. Sent free upon request to the Waltham Watch Company, Waltham, Mass.



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(Onyx, diamonds and platinum)

The movement is smaller than a dime in diameter

Makers of the famous Waltham air friction quality Speedometers and Automobile Time-pieces, used on the world's leading cars

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Jasper Park, Alberta, and Mount Robson Park, British Columbia, embrace the scenic mountain wonders of the Dominion.

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Makes a Spotless Closet Bowl

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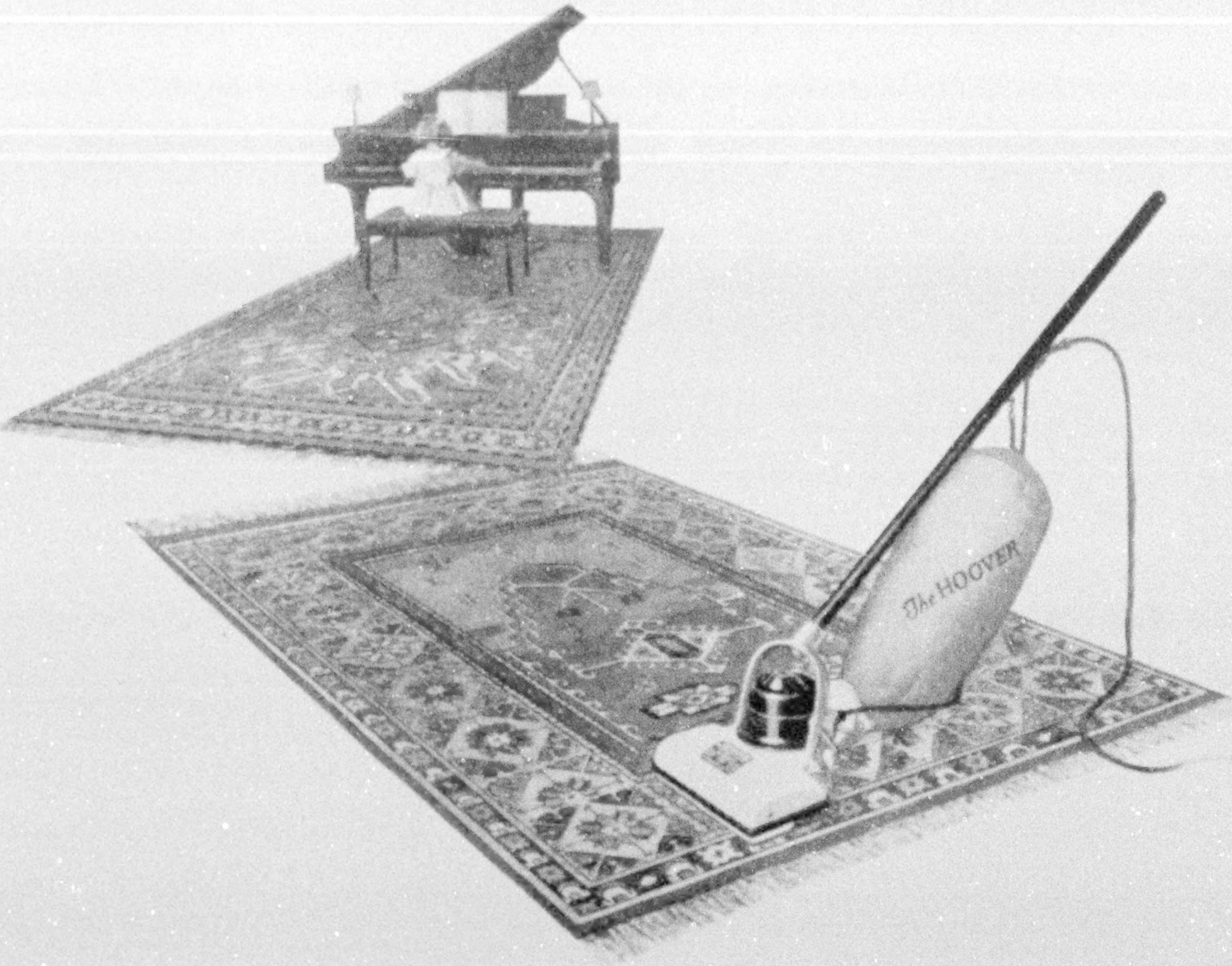

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It Beats — as it Sweeps — as it Cleans

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You will enjoy hearing the birds sing and watching them feed their young. They will eliminate mosquitos, gnats and other insects which destroy your trees, shrubbery and garden.

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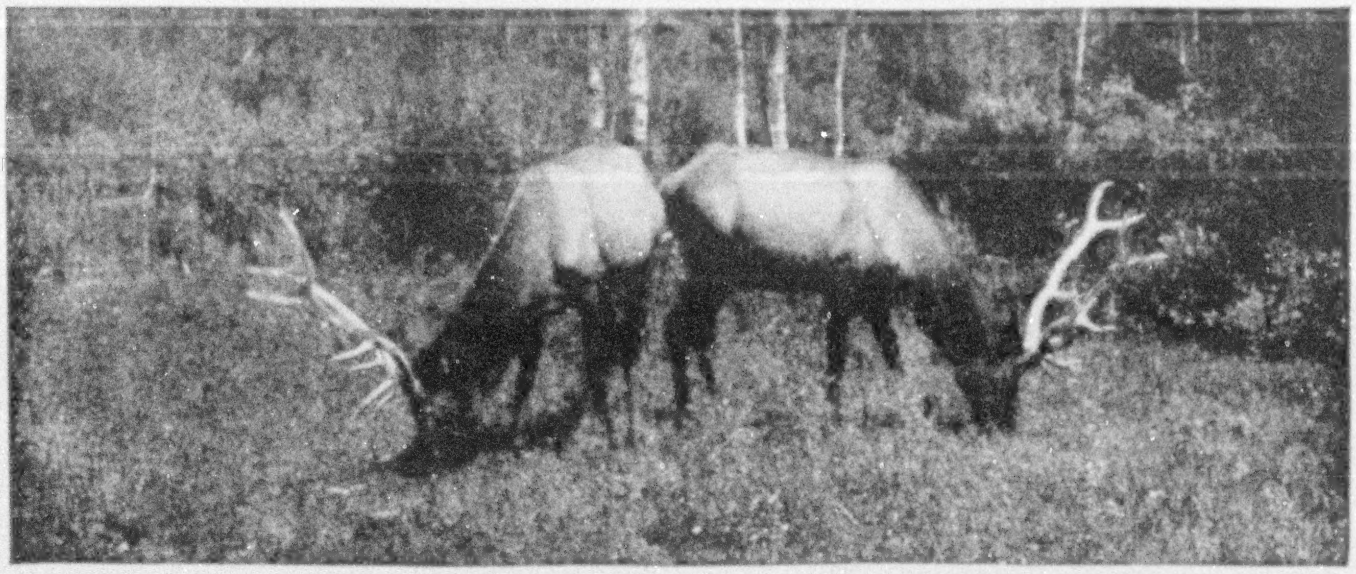

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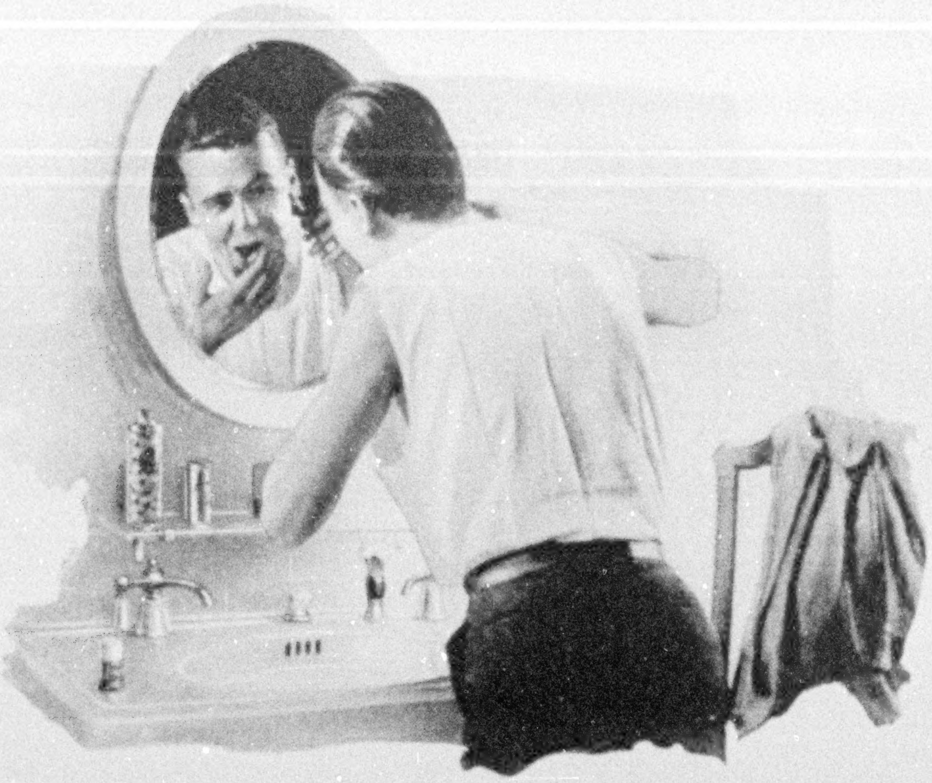


Chin Golf! *Out in 38—and coming easy!*

DO you play Chin Golf? It is the latest popular game. Play it Winter or Summer; at home or at your club.

Chin Golf is not a 19th hole proposition—nothing like stove baseball or conversational tennis, but a regular indoor sport.

Any man who shaves himself can play it. Count your razor strokes when you shave, and see how low a score you can make. It puts fun and friendly rivalry into shaving.

If you are a golfer, you will get the idea at once; but, even if you never have schlaffed with a driver, nicked with a niblick, or been bunkered, you may be a winner at Chin Golf.

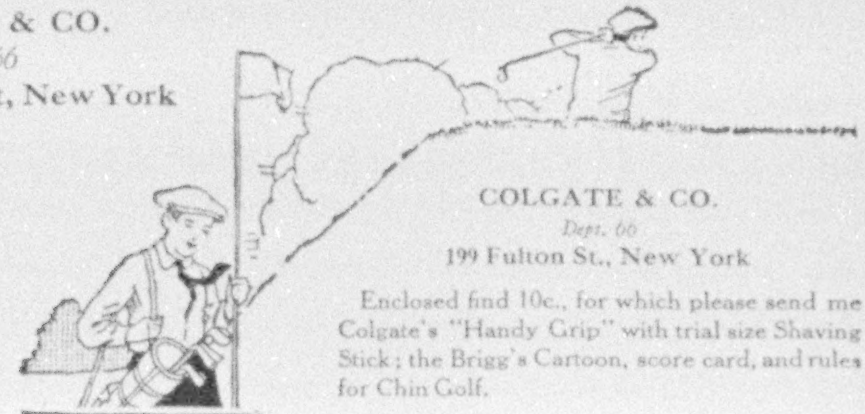
You are sure to like the course and have a good score if you use Colgate's "Handy Grip" Shaving Stick.

Fill out the attached coupon, mail it to us, with 10c. in stamps, and we will send you a "Handy Grip," containing a trial size Colgate Shaving Stick. Also we will send you, free, a score card, the rules for playing Chin Golf, and a screamingly funny picture made especially for Colgate & Co. by Briggs, the famous cartoonist.

The picture is on heavy paper, suitable for framing or tacking up in locker rooms. It will help you to start every day with a round of fun.

"And then he took up Chin Golf"

COLGATE & CO.
Dept. 66
199 Fulton Street, New York



COLGATE & CO.
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199 Fulton St., New York

Enclosed find 10c., for which please send me Colgate's "Handy Grip" with trial size Shaving Stick; the Brigg's Cartoon, score card, and rules for Chin Golf.

Name..

Address..

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Dutch Bulbs
Order your Supply Now!

Advices from big growers in Holland indicate great scarcity of bulbs this coming season and enough cannot be grown to meet the demand. To insure getting your supply send us your order at once. **Until July 1st, not later,** our present low prices for the choicest varieties of bulbs grown by specialists in Holland will hold good.

By ordering from us now instead of waiting until Fall, you make a large saving, *get a superior quality of Bulbs not usually to be obtained at any price in this country,* and have a much larger list of varieties to select from.

Hyacinths, Tulips, Narcissi, Crocus, give, for a small outlay of time and money, an abundance of flowers in the house from December until Easter, and in the garden from earliest spring until the middle of May.

Our orders are selected and packed in Holland, and are shipped to our customers immediately upon their arrival in the best possible condition.

They need not be paid for until after delivery, nor taken if not satisfactory.

Write for
Free Booklet

Our booklet contains descriptions and prices of almost a thousand of the choicest imported Dutch Bulbs, suitable for growing in the house or garden, and the directions given make failure practically impossible.

ELLIOTT NURSERY
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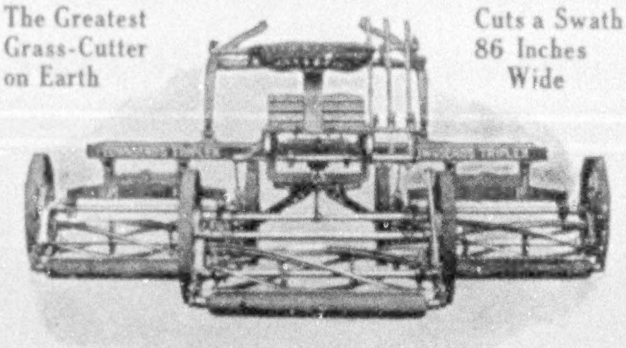
Established 30 years. We have built up one of the largest bulb businesses in the world.

TOWNSEND'S TRIPLEX

The Greatest Grass-Cutter on Earth

Cuts a Swath 86 Inches Wide



Floats Over the Uneven Ground as a Ship Rides the Waves

One mower may be climbing a knoll, the second skimming a level, and the third paring a hollow. Drawn by one horse and operated by one man, the TRIPLEX will mow more lawn in a day than the best motor mower ever made; cut it better and at a fraction of the cost.

Drawn by one horse and operated by one man, it will mow more lawn in a day than any three ordinary horse-drawn mowers with three horses and three men.

Does not smash the grass to earth and plaster it in the mud in springtime, neither does it crush the life out of the grass between hot rollers and hard, hot ground in summer, as does the motor mower.

The public is warned not to purchase mowers infringing the Townsend Patent, No. 1,209,519, December 19th, 1916.

Write for catalog illustrating all types of Lawn Mowers.

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254 Glenwood Avenue **Bloomfield, N. J.**

JUDD & DETWEILER, INC.
Master Printers
ECKINGTON PLACE AND FLORIDA AVE.
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Robin—Wren—Bluebird
3 for $5.00 and Parcel Post (wt., 9 lbs.)

THEIR SECOND BROOD

Raised in these rustic houses will prove veritable music boxes. (Not too late to place these houses now.)

Protect Them

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Size of Crescent Sparrow Trap, 18 x 18 inches

Sparrow Trap
$5 and P. P. (wt., 9 lbs.)

Crescent Company - - - - - "Birdville," Toms River P. O., N. J.

The Pro-phy-lac-tic is the ONE Tooth Brush in universal use today—everywhere

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The memorial—mute expression of a common desire to leave behind us some lasting record. Every age, from the Catacombs of Rome to the Indian Mounds, has left these symbols of faith in varying degrees of preservation.

But men today are building, with greater assurance, monuments that will indeed endure forever. For in ROCK OF AGES Granite they have found the ideal material, combining eternal permanence and matchless beauty. ROCK OF AGES, in its fineness of texture, distinctive gray color, and rich polish, is the ultimate in monumental art.

The selection of your memorial deserves unhurried judgment. Plan it with your local dealer and let it be in ROCK OF AGES Granite, protected by a certificate of perfection.

The intimate story of ROCK OF AGES sent on request.

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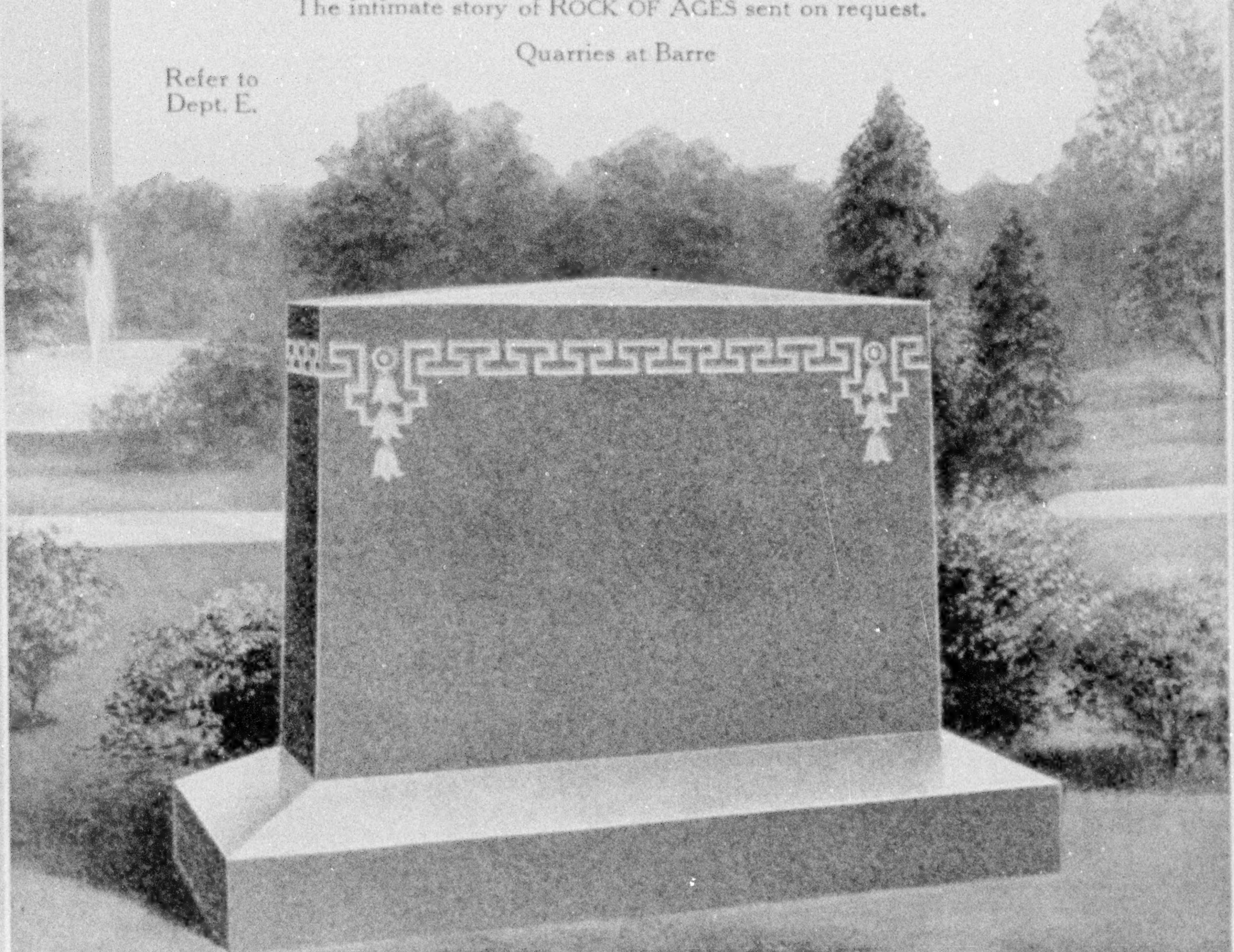

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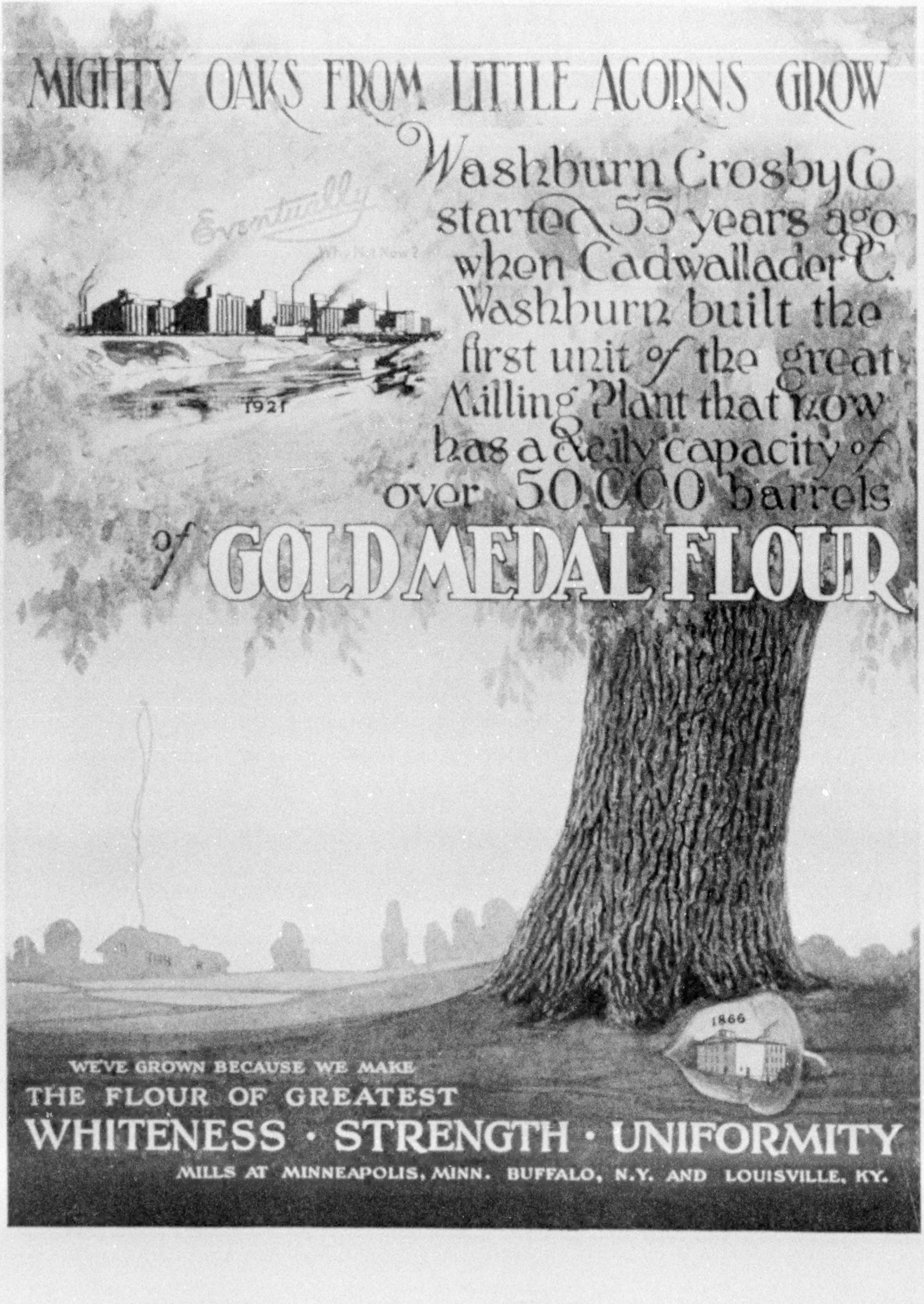
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